

## Transmittal

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**Date:** April 25, 2012  
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**Project Number:** 0106270030, Phase 6  
**Project Name:** Former Pechiney Cast Plate Facility (3200 Fruitland Avenue)

Item	Description
1	March 2012 Response to the Department of Toxic Substances Control (DTSC) Comment to July 2011 FS and RAP
2	April 23, 2011 Redline Version of the FS and RAP

### Remarks

Please find enclosed the above referenced documents for the Pechiney site. We are working with DTSC to finalize these documents, and anticipate receiving DTSC's approval of the draft FS and RAP by the end of April 2012. DTSC is working with us to accelerate the process to initiate the 30-day public comment period as soon as possible. If you have any questions, please contact Linda Conlan at (949) 574-7083.

***Please note - We've moved and our new address is provided above***

Sincerely yours,  
AMEC

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## ACRONYMS AND ABBREVIATIONS

AF	Attenuation Factor
Alcoa	Aluminum Company of America
ALM	Adult Lead Model
AMEC	<u>AMEC Environment &amp; Infrastructure, Inc., formerly AMEC Geomatrix, Inc.</u>
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BTEX	benzene, toluene, ethylbenzene, and total xylenes
bgs	below ground surface
Cal-EPA	California Environmental Protection Agency
Century	Century Aluminum Company
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
<u>cfu/gm-dw</u>	<u>bacteria colony forming units per gram of soil dry weight</u>
CFR	Code of Federal Regulations
CHHSL	California Human Health Screening Level
COC	Chemical of Concern
<del>cfu/gm dw</del>	<del>bacteria colony forming units per gram of soil dry weight</del>
COPC	chemical of potential concern
<u>CPT/ROST</u>	<u>cone penetration test/rapid optical screening test</u>
Cr (VI)	hexavalent chromium
DAF20	Dilution Attenuation Factor of 20
<u>1,2-DCA</u>	<u>1,2-dichloroethane</u>
<u>1,1-DCE</u>	<u>1,1- dichloroethene</u>
DPH	Department of Public Health
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EDR	Environmental Data Resource

<u>EPC</u>	<u>Exposure Point Concentration</u>
ESA	Environmental Site Assessment
FS	Feasibility Study
Geomatrix	Geomatrix Consultants, Inc., and AMEC Geomatrix, Inc.
GRA	General Response Actions
H&EC	City of Vernon Health & Environmental Control
HHRA	Human Health Risk Assessment
HI	Hazard Index
HPWD	City of Huntington Park Water Department
HQ	Hazard Quotient
MCL	Maximum Contaminant Level
MNA	monitored natural attenuation
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
<u>mg/kg/year</u>	<u>milligrams per kilogram per year</u>
NCP	National Contingency Plan
O&M	Operation and Maintenance
OEC	Other Environmental Condition
OEHHA	Office of Environmental Health Hazard Assessment
<u>Order</u>	<u>Imminent and Substantial Endangerment Determination and Consent Order</u>
pg/g	picograms per gram
PCB	Polychlorinated Biphenyl
PCBNP	Polychlorinated Biphenyl Notification Plan
PCE	Tetrachloroethene
Pechiney	Pechiney Cast Plate, Inc.
PPE	Personal Protective Equipment
PRG	Preliminary Remediation Goal
RAO	Remedial Action Objective

RAP	Remedial Action Plan
RBSL	Risk-Based Screening Level
REC	Recognized Environmental Condition
RI/FS	Remedial Investigation/Feasibility Study
RWQCB	California Regional Water Quality Control Board, Los Angeles Region
<u>SAP</u>	<u>Sampling and Analysis Plan</u>
SCAQMD	South Coast Air Quality Management District
SCM	Site Conceptual Model
Site	Former Pechiney Cast Plate, Inc. Facility, 3200 Fruitland Avenue, Vernon, California
SSL	Soil Screening Level
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
TBC	to-be-considered
<u>1,1,1-TCA</u>	<u>1,1,1-trichloroethane</u>
TCE	trichloroethene
<u>TEQ</u>	<u>Toxic Equivalent</u>
<u>TEF</u>	<u>Toxic Equivalent Factor</u>
<u>TEPH</u>	<u>Total extractable petroleum hydrocarbons</u>
TMB	trimethylbenzene
TPH	total petroleum hydrocarbons
TPHCWG	Total Petroleum Hydrocarbon Criteria Working Group
TRPH	total recoverable petroleum hydrocarbons
TSCA	Toxic Substances Control Act
<u>TVPH</u>	<u>Total volatile petroleum hydrocarbons</u>
URS	URS Corporation
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank

Vernon Facility    Former Pechiney Cast Plate, Inc. Facility, 3200 Fruitland Avenue, Vernon, California

VOC                volatile organic compound

VWD                City of Vernon Water Department

WHO                World Health Organization

**FEASIBILITY STUDY**  
Former Pechiney Cast Plate, Inc. Facility  
3200 Fruitland Avenue  
Vernon, California

## 1.0 INTRODUCTION

AMEC Environment & Infrastructure, Inc. (AMEC; formerly AMEC Geomatrix, Inc. (AMEG), has prepared this Feasibility Study (FS) on behalf of Pechiney Cast Plate, Inc. (Pechiney), for the former Pechiney facility (Vernon Facility or Site) located at 3200 Fruitland Avenue in Vernon, California (Figure 1). This FS evaluates potentially applicable remedial technologies and provides recommendations for the proposed, preferred remedy for impacted soil and soil vapor within the vadose zone, impacted groundwater, and impacted concrete at the Site using the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) guidance (United States Environmental Protection Agency [U.S. EPA], 1988). In addition, an evaluation of the potential for continued or future impacts to groundwater quality from soil impacts in the vadose zone is presented in this FS.

Based on the proposed preferred remedies discussed in this FS, a Remedial Action Plan (RAP) (AMEC, 2012<sup>4</sup>) has been prepared to mitigate chemicals of concern (COCs; including metals) in the vadose zone that exceed proposed site-specific remediation goals. Implementation details for the proposed, preferred alternatives are discussed in the RAP. Upon finalization of the FS, the RAP is to be implemented 1) pursuant to the Department of Toxic Substances Control (DTSC) Imminent and Substantial Endangerment Determination and Consent Order between the DTSC and Pechiney (Order; DTSC, 2010), 2) pursuant to the City of Vernon Health and Environmental Control (H&EC; also referred to as the City of Vernon Environmental Health Department) existing orders/directives, and 3) pursuant to the directive/order from any other necessary public agency including U.S. EPA with respect to the polychlorinated biphenyls (PCB)-impacted concrete and soil at the Site. The RAP discusses remedial alternatives for soil and soil vapor impacted with volatile organic compounds (VOCs) and petroleum hydrocarbons (including Stoddard solvent compounds); soil impacted with metals (specifically, arsenic) and PCBs; groundwater impacted with VOCs; and demolition and disposal of concrete impacted with PCBs. On July 6, 2010, DTSC issued the Order, and DTSC has approval authority for implementation of the proposed site-wide RAP. Pursuant to Code of Federal Regulations (CFR), Title 40, Subchapter R, Toxic Substances Control Act (TSCA), Part 761 (40 CFR 761) including applicable amendments (June 29, 1998, 40 CFR Parts 750 and 761), U.S. EPA has approval authority for risk-based remediation of PCB

releases and disposal of PCB-remediation waste (soil and concrete). Pursuant to TSCA, a risk-based application referred to as the Polychlorinated Biphenyls Notification Plan (PCBNP; AMEC, 2009) was submitted to U.S. EPA on July 13, 2009. On July 2, 2010, U.S. EPA issued a conditional approval letter regarding the PCBNP, which outlined requirements for additional PCB sampling and submission of additional information. In the conditional approval letter, U.S. EPA also deferred the approval of the PCB remediation goals until the additional PCB sampling results and information was submitted to U.S. EPA for review. The results of the additional sampling were submitted to U.S. EPA on December 29, 2010. U.S. EPA's conditional approval of the PCB remediation goals was granted on July 1, 2011. This FS was revised to address additional comments made by DTSC to the September 2009 draft FS, and additional requirements imposed by U.S. EPA.

Remedial alternatives similar to those proposed in this FS would be applied to any shallow impacted soil or concrete discovered during the below-grade demolition work.

The FS has been prepared using 40 CFR 300, also known as the National Contingency Plan (NCP; U.S. EPA, 1990), and other guidance documents developed by the U.S. EPA. Under the NCP 40 CFR 300.430(d)(1), potential future exposure scenarios are used to develop site-specific, risk-based remediation goals. For this Site, several exposure scenarios were evaluated, including potential exposures related to future construction and future commercial/industrial use at the Site.

This FS includes the following information (listed by relevant section).

- Section 2.0 provides a Site description and history along with the geologic and hydrologic settings.
- Section 3.0 summarizes the scope and findings of previous remedial investigations and discusses the nature and extent of known impacted areas.
- Section 4.0 presents the Site Conceptual Model (SCM) and the results of a screening-level human health risk assessment (HHRA).
- Section 5.0 introduces the remedial action objectives (RAOs) for the Site; proposed remediation goals; summarizes areas of known impacts; and presents the general response actions (GRAs), that when implemented, will meet the RAOs for the Site.
- Section 6.0 discusses the screening criteria and evaluation process used for selection of potential remedial alternatives.
- Section 7.0 provides a detailed evaluation of the remedial options identified during the screening process.
- Section 8.0 presents the proposed, preferred remedial alternatives for the Site.

- Section 9.0 discusses the community involvement process.
- Section 10.0 provides a list of references used to prepare the FS.

## 2.0 BACKGROUND

This section summarizes the Site description and history and the geologic and hydrogeologic setting.

### 2.1 SITE DESCRIPTION AND HISTORY

The Site was once part of a 56-acre, aluminum manufacturing facility owned and operated by Aluminum Company of America (Alcoa). The historical and current Site plans of the former Alcoa facility are shown on Figures 2 and 3, respectively.

Alcoa's manufacturing operations at the Site reportedly began in approximately 1937. Previous manufacturing at the Site included production of high-precision cast aluminum plates. As part of their manufacturing operations, Alcoa used fuels and Stoddard solvent, both of which were stored in underground storage tanks (USTs). Alcoa used Stoddard solvent as part of the aluminum manufacturing process. Alcoa also operated processes that required lubricating and hydraulic oils and generated hazardous waste that was stored at various locations throughout the Site. In approximately 1997, Alcoa sold the eastern half of the facility, which subsequently was razed, subdivided, and redeveloped for industrial and commercial uses. In December 1998, Alcoa sold the western portion of the facility (3200 Fruitland Avenue) to Century Aluminum Company (Century). In 1999, Pechiney purchased the Site from Century. At that time, Alcoa investigated subsurface conditions and conducted limited remediation in both the eastern and western portions of the facility as part of their efforts to seek the closure of its City of Vernon H&EC hazardous materials permit.

The Site is comprised of approximately 26.9 acres (including Assessor Parcel Numbers 6301-008-010, -011, -012, -013, which was divided into Parcels 6, 7, and 8; Figure 3) and was formerly occupied by approximately 600,000 square feet of building area. As part of the aboveground demolition work completed in November 2006 at the Site, the above-ground features, including the former manufacturing facilities, were demolished, and the debris was transported off site for disposal or recycling.

The procedures for the remaining demolition work related to the removal of building slabs, pavements, below-grade man-made structures (including footings, foundation, pits, and sumps), and other structures located adjacent to the former building areas are described in the initial Below Grade Demolition Plan (Geomatrix Consultants Inc. [Geomatrix], 2006a, revised November 27, 2011, AMEC). This FS evaluates the details and procedures for remediating

impacted concrete and soil during below-grade demolition, and soil vapor during and after below-grade demolition.

## **2.2 LAND USE**

The Site is zoned for industrial use. The City of Vernon zoning regulations prohibit development of new residential properties within the City. A land use deed-covenant is proposed to be issued by Pechiney, with concurrence from the City of Vernon, to restrict future Site use (i.e., prohibit residential development) and use of groundwater from the first water-bearing unit within the Site perimeter.

The City of Vernon is in the process of purchasing the property. The future Site use will remain industrial or commercial. The City of Vernon considered using a portion of the property for a power plant. However, on September 28, 2009, the City of Vernon withdrew its certification application for the Southeast Regional Energy Project (Docket 06-AFC-04) and indicated that a new application for certification of a smaller power plant would be considered. On October 1, 2009, the California Energy Commission approved the termination of the application for certification.

## **2.3 GEOLOGIC AND HYDROGEOLOGIC SETTING**

The physical setting of the Site, including Site topography, surface water, geology, and hydrogeology, is discussed in the following subsections.

### **2.3.1 Topography and Surface Water**

Topography in the Site vicinity is shown on the United States Geological Survey (USGS) South Gate, California 7.5-minute series Topographic Quadrangle Map (1964, photorevised 1981). The Site is located in Township 2 South, Range 13 West, Section 14, San Bernardino Base & Meridian at approximately 180 feet above mean sea level. The local topographic gradient is gentle, sloping toward the south at approximately 25 feet per mile. The Los Angeles River, the surface water body nearest to the Vernon Facility, is located approximately 4000 feet north-northeast of the Site.

### **2.3.2 Geology and Hydrogeology**

Information presented in this section is based on the State of California Department of Water Resources (DWR) Bulletin 104 (DWR, 1961), or as referenced below.

#### **2.3.2.1 Geology**

Sediments underlying the Site and its vicinity are associated with Recent Alluvium, the Lakewood Formation, and the underlying San Pedro Formation. Based on basin-scale interpretations presented in DWR (1961), Recent Alluvium extends from ground surface to a



depth of approximately 100 feet and consists primarily of stream-deposited gravel, sand, silt, and clay with some interbedded marine deposits. The Recent Alluvium is underlain by approximately 150 to 200 feet of the Upper Pleistocene Lakewood Formation, which consists of alternating sequences of fine- and coarse-grained alluvial sediments. The Lakewood Formation is underlain by the Lower Pleistocene San Pedro Formation which consists of approximately 900 to 1200 feet of sand and gravel, interbedded with clays of marine origin.

Based on the documents reviewed by Geomatrix, previous investigations conducted at the former Alcoa facility (including the portion of the facility that comprise the Site) suggest the Site is underlain by fine-grained (predominantly silt) and coarse-grained (predominantly sand) sediments (referred to by others as Recent Alluvium) from ground surface to approximately 40 feet below ground surface (bgs) (Geraghty & Miller, 1991). Sediments below 40 feet are predominantly silt and clay (referred to by others as the Bellflower aquitard) from approximately 40 to 85 feet bgs, and predominantly sand (referred to by others as the Lakewood Formation) to a depth of at least 161.5 feet, the total depth of the deepest soil boring drilled at the Site (Geraghty & Miller, 1991). Although observed at different depths, similar lithology was encountered by Geomatrix during its investigations at the Site. Cross-sections depicting the lithology at the Site are shown on Figures 4 and 5.

### **2.3.2.2 Hydrogeology**

The Site is located within the Los Angeles Forebay Area of the Central Basin of the Los Angeles County Coastal Plain. The Central Basin is bounded on the northwest by the Santa Monica Mountains; on the north and northeast by the Repetto, Merced, and Puente Hills; on the east by Coyote Creek (the approximate Orange County/Los Angeles County line); and on the south and west by the Pacific Ocean. The Central Basin is largely composed of alluvial sediments shed from the surrounding hills and mountains (DWR, 1961).

Aquifers between ground surface and a depth of approximately 700 feet bgs at the Site include the Exposition, Gage, Hollydale, Jefferson, and Lynwood aquifers. The Exposition and Gage aquifers are part of the Lakewood Formation, while the Hollydale, Jefferson, and Lynwood aquifers are part of the underlying San Pedro formation. Below the Lynwood aquifer are the Silverado and Sunnyside aquifers of the San Pedro formation. These aquifers have variable thicknesses and are separated by undifferentiated finer-grained sediments. Perched groundwater may be associated with the Bellflower aquiclude in the Recent Alluvium (DWR, 1961).

Historical boring logs indicate shallowest groundwater beneath the Site was encountered within a sand unit, interpreted to be the Exposition aquifer within the Lakewood Formation, between depths of 145 and 150 feet bgs (Geraghty & Miller, 1991 and 1995). Groundwater

was encountered by Geomatrix at a depth of approximately 150 feet in soil borings advanced in the northern portion of the Site (Geomatrix, 2006b and 2006c). Boring logs reviewed by Geomatrix did not indicate the presence of perched groundwater above and within sediments interpreted as the Bellflower aquiclude. Perched groundwater was not observed during Geomatrix's Site investigations (Geomatrix, 2006b and 2006c).

The California Regional Water Quality Control Board, Los Angeles Region (RWQCB) Basin Plan (RWQCB, 1994) designates groundwater in the site vicinity for beneficial use. According to information provided by the City of Vernon H&EC, groundwater is produced off site from the Jefferson, Lynwood, Silverado, and Sunnyside aquifers from depths of approximately 450 to 1400 feet bgs (based on wells No. 15 and 19; Geoscience, 2005).

Additional information regarding water supply wells in the vicinity of the Site was presented in the Phase I Environmental Site Assessment (ESA) report (Geomatrix, 2005a). In summary, fifteen municipal water supply wells, nine USGS monitoring wells, and one well listed by the Environmental Data Resource (EDR) Aquiflow Database were identified within a 1-mile radius of the Site (EDR, 2005). Seven wells belong to the City of Vernon Water Department (VWD) and four wells belong to the City of Huntington Park Water Department (HPWD). The remaining 10 wells did not have ownership listed in the EDR report.

Of the fifteen designated municipal wells, two VWD municipal well clusters are located within a 1-mile radius of the Site and consist of six active wells (VWD well numbers 11, 12, 15, 16, 17, and 19); two inactive wells (VWD well numbers 5 and 7); and three destroyed wells (VWD well numbers 9, 10, and 13). In addition, one well cluster is located approximately ½-mile northwest of the Site and the other well cluster is located approximately ⅓-mile northeast of the Site.

HPWD municipal wells located within a 1-mile radius of the Site consist of two active wells (HPWD well numbers 14 and 17); one inactive well (HPWD well number 9); and one destroyed well (HPWD well number 11). One active well is located approximately ½-mile southwest of the Site, and the other active well is located approximately one mile southeast of the Site.

In preparation of Alcoa seeking environmental closure of its facility, nine groundwater monitoring wells were constructed by Alcoa between 1990 and 1991 under the oversight of the City of Vernon H&EC. Six of these monitoring wells, AOW-1, AOW-3, AOW-6, AOW-7, AOW-8, and AOW-9, were located on the Site and the other three wells were located on the eastern portion of the Alcoa facility that was previously sold and redeveloped (Figure 2). According to documents reviewed (A.J. Ursic, Jr., 1999a; Enviro-Wise, 1998; and Alcoa, 1997), all but three of these monitoring wells (AOW-6, AOW-8, and AOW-9) were destroyed by Alcoa under the oversight of the City of Vernon H&EC. The three remaining groundwater

monitoring wells are located near former Building 112A in the southern portion of Parcel 7. Groundwater monitoring conducted between 1990 and 1997 indicates that the depth to groundwater beneath the Site during that time ranged from approximately 135 to 158 feet bgs (Enviro-Wise, 1998). ~~Recently R~~reported groundwater depth measurements ranged from 136.24 to 140.40 feet below top of well casing in wells AOW-6 and AOW-8, respectively (URS Corporation [URS], 2006). Groundwater monitoring data are provided in Appendix A. Groundwater flow direction was reported as west-northwesterly (Geraghty & Miller, 1991 and 1995; Enviro-Wise, 1998; and URS, 2006). In addition, the groundwater flow direction was reported to the west-northwest for other properties in the Site vicinity (Environmental Audit, Inc., 2009). Regional groundwater flow in the vicinity of Vernon is to the west as depicted on a 2001 groundwater elevation contour map (Water Replenishment District of Southern California, website located at <http://www.wrd.org>).

### 3.0 SITE CHARACTERIZATION

This section discusses investigations and assessments, including previous remediation activities, conducted at the Site. Sampling data collected from previous investigations conducted at the Site are summarized in Appendix A, and sample locations are shown on Figure 6.

#### 3.1 ALCOA'S PREVIOUS INVESTIGATIONS

Previous investigations were conducted by consultants to Alcoa and were related to closure of Alcoa's facilities and operations on and east of the Site (including Alcoa's efforts to seek closure of its City of Vernon H&EC hazardous materials permit). These investigations were conducted under the oversight of the City of Vernon H&EC. Previous investigations included the collection and analysis of soil, groundwater, soil vapor, and building materials samples. A summary of previous Alcoa investigations is presented in the Phase I ESA (Geomatrix, 2005a). During these investigations, soil impacted with petroleum hydrocarbons (including Stoddard solvent), metals, PCBs, and VOCs were identified. The presence of chlorinated VOCs also was identified in groundwater at a depth of approximately 150 feet bgs within the southwestern portion of Parcel 7, west of Building 112A. In addition, limited soil remediation was conducted in discrete areas of the Site by Alcoa as discussed in Section 3.2.

In 1999, the City of Vernon H&EC issued a letter approving these remedial actions with specific provisions that include the following.

- Stoddard solvent impacts to soil would be addressed by Alcoa.
- Future review and determinations may be necessary if subsequent information, which significantly affects any decision, is found regarding the Site.

In a subsequent letter dated July 18, 2006, the City of Vernon H&EC required that Alcoa provide a plan by August 30, 2006 for active remediation of the Stoddard solvent-impacted soil (City of Vernon, 2006). The requirements for active remediation were based on the most recent soil data indicating that Stoddard solvent contamination exceeded cleanup standards and that the overlying buildings and foundations, which limited the physical removal of the impacted soil, would be removed. According to the City of Vernon H&EC, Alcoa did not submit the required plan.

As part of Alcoa's preparation for seeking closure of its facility, groundwater wells were installed at the Site in 1990 by Alcoa under the oversight of the City of Vernon H&EC as discussed in Section 2.3.2.2. The locations of the monitoring wells are shown on Figure 2. Groundwater quality data collected from monitoring wells sampled and analyzed between 1990 and 1997 indicated the presence of trichloroethene (TCE); 1,2-dichloroethane (1,2-DCA); and chloroform in the upper portion of the Exposition aquifer (first water-bearing unit) in groundwater beneath the southwest portion of the Site with historical concentrations of 160 micrograms per liter ( $\mu\text{g/L}$ ), 370  $\mu\text{g/L}$ , and 105  $\mu\text{g/L}$ , respectively, of TCE, 1,2-DCA and chloroform (Enviro-Wise, 1998). The highest concentrations of these VOCs were detected in groundwater in the vicinity of the former Stoddard solvent USTs located outside of Building 112A in Parcel 7. Although groundwater was impacted with TCE, 1,2-DCA and chloroform, these chemicals were not detected in soil in the vicinity of the Stoddard solvent USTs (historical soil data are provided in Appendix A).

Previous evaluations conducted by Alcoa suggested the source of VOCs in groundwater in the southwest portion of Parcel 7 was from an upgradient, off-site source. At the time, the City of Vernon H&EC concurred with this evaluation, but because the closure of the groundwater wells would require RWQCB concurrence and approval, Alcoa submitted its recommendations for Site closure to the RWQCB on February 18, 1999 (Alcoa, 1999). Because groundwater at these wells was impacted by chlorinated VOCs and because the wells were located in an area associated with the former Stoddard solvent USTs, the RWQCB required that Alcoa perform additional analysis of groundwater for methyl tertiary-butyl ether and fuel oxygenates (RWQCB, 2002). Alcoa conducted additional monitoring of the remaining three groundwater wells in 2005 and 2006 and submitted the monitoring data to the RWQCB. Based on the monitoring results, the concentrations of chlorinated VOCs decreased relative to the concentrations reported earlier (1990-1997). The compounds TCE, 1,2-DCA, and chloroform were detected at concentrations up to 28  $\mu\text{g/L}$ , 6.1  $\mu\text{g/L}$ , and 8.6  $\mu\text{g/L}$ , respectively, during the most recent 2006 sampling event in 2006 (URS, 2006). These compounds were not detected in groundwater samples collected from well AOW-6.

In a March 28, 2008 letter, the RWQCB directed Alcoa to 1) provide a work plan to characterize residual soil contamination in the former Stoddard solvent UST area and submit a site-specific health and safety plan by April 25, 2008; 2) sample the groundwater wells in the former UST area (AOW-7, AOW-8 and AOW-9) or install and sample replacement groundwater wells if AOW-7, AOW-8 and AOW-9 cannot be used or located; 3) submit additional historical reports and data related to the Stoddard solvent releases; 4) analyze soil and groundwater for a specific suite of petroleum hydrocarbon compounds and VOCs; 5) log and sample soil at 5-foot intervals, at lithologic changes, or observed impacted soil; and 6) initiate electronic submittals through the State database (RWQCB, 2008a).

In December 2008, the RWQCB (2008b) determined that the impacts associated with chlorinated solvents in soil and groundwater at the Site, including the area of the former Stoddard solvent USTs, should be addressed under the jurisdiction of the DTSC. Although the Stoddard solvent impacts remain the responsibility of Alcoa, as directed by the September 2, 1999 and the July 18, 2006 letters from the City of Vernon H&EC, and a January 16, 2009 letter from the RWQCB, Alcoa has not taken responsibility for these impacts. On January 18, 2009, the RWQCB confirmed completion of Alcoa's site investigation and corrective actions to address soil impacts related to eight former USTs (containing gasoline diesel/No. 2 fuel oil and waste oil). The RWQCB specially excluded however, "subsequent investigations and/or remediation of the residual contamination associated with chlorinated solvents in soil and groundwater for the entire site, including the area [formerly] containing four Stoddard solvent USTs." In addition, RWQCB closure documentation specifically excluded the closure of the four Stoddard solvent USTs (referred to as USTs T-9 through T-12). The RWQCB deferred these remaining issues to the DTSC's oversight. Pursuant to the DTSC Order and the above actions, the Stoddard solvent-impacts and associated residual petroleum hydrocarbon-impacts have been included in this FS.

### **3.2 ALCOA'S PREVIOUS REMEDIATION ACTIVITIES**

Consultants to Alcoa have previously conducted remediation activities in specific areas of the Site under the direction of the City of Vernon H&EC. These remediation activities are briefly described below and the locations are shown on Figure 6.

- July to October 1992 – excavation of diesel fuel-impacted soil in conjunction with removal of three 10,000-gallon diesel USTs and a pump vault located south of electrical substation #2. The excavations were backfilled with engineered fill, compacted, and capped with concrete (OHM Remediation Services Corporation, 1992).
- January 1995 – removal of four 10,000-gallon Stoddard solvent USTs located west of Building 112A. The maximum excavation depth was 18 feet bgs. The area was backfilled with Stoddard solvent-impacted soil from 3 to 18 feet bgs. At that time,

the City of Vernon H&EC "agreed that Alcoa could place the contaminated soil back into the excavation, provided that Alcoa would remediate the Site within a reasonable time frame" (CCG Group, Inc., 1995). A 6-mil plastic liner was placed over the Stoddard solvent-impacted soil, and clean soil was backfilled over the liner from 3 feet bgs to grade. The area was then capped with concrete.

Following the removal of the Stoddard solvent USTs and delivery system in January 1995, Alcoa conducted a soil investigation to evaluate the extent of the Stoddard solvent impacts (Morrison Knudsen Corporation, 1995). A number of investigations were performed by Alcoa between 1995 and 2005 (Environmental Protection and Compliance, 2006), and these investigations are described below.

- September through October, 1995 – Alcoa conducted an initial soil investigation to evaluate the extent of Stoddard solvent-related soil impacts beneath Building 112A and west of the building near the former Stoddard solvent USTs (Morrison Knudsen Corporation, 1995). The areas investigated included the former tube mill and roll stretcher machine area (Area "A" borings), the former tube mill Stoddard solvent dip tanks and vault (Area "B" borings), the scalper planar machine and Stoddard feed line area (Area "C" borings), and the Stoddard solvent still house and UST area (Area "D" borings). Soil borings were advanced to depths between 45 to 67.5 feet bgs and cone penetration test/rapid optical screening test (CPT/ROST) borings were advanced to depths between 34 and 80.7 feet bgs. Petroleum hydrocarbon analyses included quantification of total volatile petroleum hydrocarbons (TVPH; carbon-chain range of c6 – c10) and total extractable hydrocarbons (TEPH; carbon chain range of c10 – c28). The soil TVPH concentrations ranged between 1.1 milligram per kilogram (mg/kg) to 76,000 mg/kg and TEPH concentrations ranged between 5.4 mg/kg to 53,000 mg/kg. The highest concentrations of these compounds were detected in Area B at depths between 46.5 and 50 feet bgs. Several soil samples also were tested for benzene, toluene, ethylbenzene, and total xylenes [BTEX] compounds, and these compounds were detected in soil. Based on AMEC's review of the soil sample analytical results and qualitative petroleum hydrocarbon measurements obtained by CPT/ROST methods, the extent of these soil-impacts was assessed with the exception of two areas. The vertical extent of petroleum hydrocarbon-impacted soil was not completely assessed in Areas B and D. The approximate lateral extent of the Stoddard solvent-related soil impacts are shown on Figure 6 and the historical analytical soil results are included in Appendix A.
- August to November 1995 – Alcoa completed laboratory bench-scale treatability testing on Stoddard solvent-impacted soils obtained from the subsurface in the vicinity of former solvent handling and storage areas within Building 112A. The testing was conducted to determine the applicability of in situ bioremediation of vadose zone soils. The treatability testing included the use bioslurry reactor vessels and soil column reactors (Alcoa Technical Center, 1996a).

Analytical testing indicated that appropriate environmental conditions (including pH, naturally occurring nutrients, indigenous microbial

populations, and soil moisture) existed to depths of 45 feet bgs that would be supportive of in situ biodegradation of Stoddard solvent-impacted soil. The primary findings associated with the bioslurry reactor testing indicated that under optimal test conditions, 50 percent of the hydrocarbons were degraded within four weeks under aerobic conditions within the reactor, and that less than 5 percent of the hydrocarbons were lost due to volatilization. The primary findings from column reactor studies further supported that Stoddard solvent-impacted soils were amenable to biodegradation as hydrocarbon concentrations were reduced by 93 to 95 percent using a combination of biodegradation (80 percent) and volatilization (13 to 14 percent). Furthermore, significantly high levels of heterotrophic bacteria ( $10^8$  to  $10^9$  colony forming units per gram of soil dry weight [cfu/gm-dw soil]) and hydrocarbon degraders ( $10^5$  to  $10^6$  cfu/gm-dw soil) were found to be present within the soil (Alcoa Technical Center, 1996a). The results indicated that the addition of moisture and nutrients did not significantly alter degradation rates of the hydrocarbons.

- In 1995, on behalf of Alcoa, Morrison Knudsen Corporation and Groundwater Technology performed field trial tests to evaluate the applicability of soil vapor extraction (SVE) and bioventing technologies as remedial alternatives to mitigate the Stoddard solvent-impacted soils at the Site. Test procedures consisted of both vapor extraction and air injection with monitoring for oxygen, carbon dioxide, and soil gas. The report concluded that both technologies were viable and could be implemented if desired to remediate the Stoddard solvent-impacted soils (Alcoa Technical Center, 1996a).
- In 1996, Alcoa generated additional field respirometry testing data suggesting that naturally-occurring aerobic and anaerobic intrinsic bioremediation was on-going at the Site. The data indicated that natural aerobic degradation was occurring due to available molecular oxygen at rates of 200 to 400 milligrams per kilogram per year (mg/kg/year). The data also indicated that much slower degradation rates of 7 mg/kg/year were occurring through anaerobic biodegradation. The report indicated that Alcoa proposed intrinsic bioremediation (also referred to as monitored natural attenuation) as the passive full-scale remediation approach for Stoddard solvent-impacted soils (Alcoa Technical Center, 1996b).
- September and October 2005 - Alcoa conducted additional soil testing in 2005 to monitor the progress of the natural degradation of Stoddard solvent-related soil impacts in soil boring areas A, B, C and D (Environmental Protection and Compliance, 2006). AMEC compared the soil data collected in 2005 by Environmental Protection and Compliance to the soil data collected in 1995 by Morrison Knudsen Corporation to evaluate petroleum hydrocarbon concentration changes over time. The findings of this comparison are summarized below.

○

Area	Findings
A	<ul style="list-style-type: none"> <li>• TVPH and TEPH concentrations decreased over time.</li> <li>• Remaining TVPH and TEPH maximum concentrations reported in 2005 were at 6080 mg/kg and 6200 mg/kg, respectively.</li> <li>• Concentrations greater than 1000 mg/kg remain at depths of 30 and 40 feet.</li> <li>• Vertical extent of soil impacts was assessed to 60 feet.</li> </ul>
B	<ul style="list-style-type: none"> <li>• TVPH and TEPH concentrations increased over time at several depth intervals.</li> <li>• Remaining TVPH and TEPH maximum concentrations reported in 2005 were at 41,600 mg/kg and 60,600 mg/kg, respectively (at a depth of 45 feet in boring B-1).</li> <li>• Concentrations greater than 10,000 mg/kg remain at depths of 45 and 50 feet.</li> <li>• Vertical extent was not assessed; <u>total petroleum hydrocarbon (TPH)</u>-impacted soil was detected to a depth of 50 feet.</li> </ul>
C	<ul style="list-style-type: none"> <li>• TVPH and TEPH concentrations decreased over time.</li> <li>• Remaining TVPH and TEPH maximum concentrations reported in 2005 were at 2220 mg/kg and 2500 mg/kg, respectively.</li> <li>• TVPH concentrations greater than 1000 mg/kg remain at a depth of 15 feet and TEPH concentrations greater than 1000 mg/kg remain at a depth of 45 feet.</li> <li>• Vertical extent of soil impacts was assessed to 65 feet.</li> </ul>
D	<ul style="list-style-type: none"> <li>• TVPH and TEPH concentrations increased over time at several depth intervals.</li> <li>• Remaining TVPH and TEPH maximum concentrations reported in 2005 were at 6020 mg/kg and 10,800 mg/kg (at 45 feet at boring D-2).</li> <li>• TVPH and TEPH concentrations greater than 1000 mg/kg remain at depths of 15, 43, and 44.5 feet and TEPH concentrations greater than 10,000 mg/kg remain at a depth of 45 feet.</li> <li>• Vertical extent was not assessed; TPH impacted soil was detected to a depth of 45 feet.</li> </ul>

- Based on the soil investigations and treatability testing described in a report prepared by Environmental Protection and Compliance in 2006, Alcoa recommended to the City of Vernon H&EC that long-term natural attenuation of the Stoddard solvent-impacted soils beneath Building 112A be allowed to continue as a passive remedy (Alcoa Technical Center, 1996c). The City of Vernon H&EC replied that the remaining Stoddard solvent contamination still exceeded cleanup standards and required Alcoa to submit a plan by August 31, 2006 for active remediation of this area (City of Vernon, 2006). Alcoa has not submitted its active remediation plan and has not performed any additional monitoring or active remediation work in this area. Alcoa's refusal to submit an active remediation plan is documented in an August 30, 2006 letter that Alcoa submitted to the City of Vernon H&EC (Alcoa, 2006).



- April 1998 – excavation of ~~total petroleum hydrocarbon (TPH)~~-impacted soil in conjunction with removal of the Stoddard solvent Tube Mill dip tank located in Building 112A. The maximum excavation depth was 15 feet bgs. The area was backfilled with pea gravel and capped with concrete (A.J. Ursic, Jr., 1999a).
- June 1998 – excavation of TPH-impacted soil in conjunction with the removal of a sump from the 3-inch tube reducer foundation located in Building 112A. The maximum excavation depth was 5 feet bgs. The area was backfilled with native soil and capped with concrete (A.J. Ursic Jr., 1999a).
- October 1998 – excavation of refractory and asbestos-containing materials found in soil in conjunction with the construction of a sanitary pipeline located east of Building 112A. The maximum excavation depth was 4 feet bgs. The area was backfilled with road base and capped with asphalt (A.J. Ursic Jr., 1999a).
- December 1998 – excavation of PCB- and TPH-impacted soil in conjunction with the removal of an inert-waste disposal pit located west of Building 112A and south of the cooling tower. The maximum excavation depth was 45 feet bgs. Soil removal was terminated due to the proximity of the railroad tracks along the south and west sides of the excavation. The area was backfilled with soil and road base and capped with concrete (A.J. Ursic Jr., 1999a).
- January 1999 – excavation of PCB-impacted soil near storm water outfall #7 located west of Building 104. The maximum excavation depth was 6 feet bgs. The area excavated was limited by the presence of the adjacent sidewalk, building structures, and railroad tracks. The area was backfilled and capped with road base (A.J. Ursic Jr., 1999b).
- April 1999 – excavation of PCB-impacted soil at the discharge point of storm water outfall #6 located southwest of the cooling tower. The maximum excavation depth was 2 feet bgs. The area was backfilled and capped with road base (A.J. Ursic Jr., 1999a).
- April 1999 – excavation of PCB-impacted soil adjacent to the hot well along the north side of the cooling tower. The maximum excavation depth was 3 feet bgs. The area was backfilled and capped with road base (A.J. Ursic Jr., 1999a).
- May 1999 – excavation of PCB-impacted soil in conjunction with removal of a former condenser pad located outside the northwest corner of Building 106. The maximum excavation depth was 2 feet bgs. The area was backfilled with native soil and capped with concrete (A.J. Ursic Jr., 1999b).
- May 1999 – excavation of lead-impacted soil from a former ceramic disposal pit located beneath Building 135 on Parcel 6. The maximum excavation depth was 2 feet bgs. The area was backfilled with native soil and capped with asphalt (A.J. Ursic Jr., 1999c).
- June 1999 – excavation of PCB-impacted soil in conjunction with the removal of a French drain in Press Pit #2 located in Building 106. The maximum excavation

depth was 7 feet bgs. The area was backfilled and capped with concrete (A.J. Ursic Jr., 1999b).

The areas where previous remediation occurred as described above, including approximate horizontal limits of the excavation, excavation depth, and concentrations of remaining chemicals of potential concern (COPCs), are shown on Figure 6. As discussed in Section 3.1, the City H&EC issued a closure letter to Alcoa in 1999 with the stipulation that Alcoa would continue to maintain responsibility for the Stoddard solvent-impacted soil. The letter also stated that further review or determinations may be necessary if new information related to environmental conditions at the Site is found (City of Vernon, 1999).

### **3.3 GEOMATRIX INVESTIGATIONS**

In June 2005, Geomatrix conducted a Phase I ESA (Geomatrix, 2005a) at the Vernon Facility to identify Recognized Environmental Conditions (RECs) as defined by ASTM International, Inc. E1527-00 for Phase I ESAs. In addition to identifying RECs, Geomatrix identified historical RECs and the potential of other environmental conditions (OECs) at the Site. The Phase I ESA report was submitted to the City of Vernon on September 1, 2005, and the City of Vernon H&EC concurred with the findings in their letter dated September 26, 2005. The findings of the Phase I ESA indicated the need for additional subsurface investigation work at the Site. Geomatrix submitted a Phase II ESA work plan (Geomatrix, 2005b) to the City of Vernon H&EC on September 2, 2005, and the work plan was approved by the City of Vernon H&EC on September 26, 2005 (City of Vernon, 2005). A summary of the Geomatrix investigations is described in the following subsections.

#### **3.3.1 Phase II Investigation**

Based on the findings of the previous investigations and the manufacturing operations in each building and/or area, these COPCs were identified:

- TPH, including Stoddard solvent;
- PCBs (as total Aroclors);
- VOCs;
- metals, including hexavalent chromium [Cr (VI)]; and
- semi-volatile organic compounds (SVOCs).

Based on Alcoa's historical groundwater monitoring results, TCE, 1,2-DCA, and chloroform were identified as groundwater COPCs at the Site.

A Phase II investigation was conducted as the initial remedial investigation at the Site between November and December 2005. The investigation was conducted to evaluate whether the RECs or OECs identified in the Phase I ESA had resulted in releases to the subsurface soil and/or groundwater at the Site. The initial remedial investigation included the collection and analysis of concrete, soil vapor, and soil samples for a number of constituents. The findings of the investigation were submitted to the City of Vernon H&EC in a report dated March 9, 2006 (Geomatrix, 2006b).

Soil and soil vapor data collected during the Phase II investigation were evaluated using a stepped screening process to evaluate the potential for groundwater impacts and the potential for risks to human health due to exposure to shallow soil containing COPCs. The initial step of the screening process was to assess potential VOC impacts and the need to collect additional soil samples. Based on the soil vapor results obtained in Building 106, the collection and analysis of additional soil samples were required to further investigate potential VOC impacts.

The second step of the screening evaluation included a comparison of the Phase II soil sample results to the following prescriptive regulatory screening levels.

- Los Angeles RWQCB Interim Site Assessment and Cleanup Guidebook (May 1996, and updated March 2004) groundwater protection screening levels for carbon range-specific petroleum hydrocarbons and aromatic hydrocarbons (BTEX compounds) in soil. The selected screening levels were obtained from Table 4-1 of the above-referenced RWQCB guidance assuming a sand lithology and a depth to groundwater of 150 feet.
- U.S. EPA Region IX Preliminary Remediation Goals (PRGs) for industrial sites and concentrations for VOCs, SVOCs, PCBs, and metals in soil (U.S. EPA, 2004).
- U.S. EPA Region IX soil screening levels (SSLs) for the protection of groundwater using a default dilution attenuation factor of 20 (DAF20) for VOCs, SVOCs, and metals, where available (U.S. EPA, 2004).
- California Background Concentrations of Trace and Major Elements in California Soil (Bradford, et. al., 1996).
- California Code of Regulations, Title 22, Total Threshold Limit Concentration and Soluble Threshold Limit Concentration for metals and PCBs in building materials (waste characterization).

Based on the data collected during the Phase II investigation and the above screening evaluation process, certain areas at the Site were identified as impacted by one or more COPCs at concentrations above the screening criteria. Although the screening criteria are not intended to be remediation goals, they were used to evaluate the potential need for further action (such as additional investigation, analysis, or potential remediation). Remediation goals

may differ from screening levels based on site-specific considerations (e.g., redevelopment, future land use, potential exposure pathways, etc.), regulatory requirements, evaluation of risk, or other relevant factors as set forth in NCP 40 CFR 300.

The following areas of the Site had COPCs that exceeded one or more of the screening criteria (the boring locations discussed below are shown on Figure 6). For each of these areas, the results of the Phase II investigations indicated that additional investigation was required and the City H&EC approved these subsequent investigatory actions on March 20, 2006.

- Building 104 – PCBs were detected in the concrete slab and soil to a depth of 3 feet bgs adjacent to the location of a saw (borings 41, 73, and 74). Additional soil borings were required in the vicinity of the saw to assess the source and extent of PCBs detected in concrete and the underlying soil.
- Building 104 – PCBs were detected in soil to a depth of approximately 71.5 feet bgs in the vicinity of a vertical pit and a former vertical pit (boring 40). Additional soil borings were required near both vertical pits to assess the source and extent of PCBs detected in soil.
- Buildings 106 and 108 – TCE was detected in soil beneath the northern portion of the buildings to a depth of approximately 48 feet bgs (boring 14), and TCE was detected in soil vapor. Additional investigation of the lateral extent of TCE in soil and its potential impacts to groundwater was required in this area.
- Building 112 (former etch station) and near storm water outfall #6 – one or more metals were detected in soil to a depth of 6 feet bgs (boring 113). Additional investigation of the lateral extent of metals in shallow soil was required in these areas.
- Former substation #8 – PCBs were detected in the soil and gravel drainage area of the former substation to a depth of 2.2 feet bgs (boring 39), but they were not detected in the soil boring adjacent to the drainage area. Additional investigation of the depth of the soil and gravel drainage area and the concentrations of PCBs in these materials was required.

Although concentrations of COPCs in other areas of the Site did not exceed screening criteria, additional remedial investigations were required by the City of Vernon H&EC at three locations to further understand the source of the deeper soil impacts and to confirm that soil concentrations were not increasing with depth. These three locations are listed below.

- Building 106 – Stoddard solvent-range petroleum hydrocarbons were detected in one soil sample at a depth of approximately 46.5 feet bgs (boring 13). Because these hydrocarbon compounds were not detected in shallow soil at this boring or in soil vapor in the vicinity of the boring, further investigation of the source of these compounds at 46.5 feet bgs in soil was required.

- Building 112 – TPH concentrations in soil increased with depth at a boring drilled to a depth of 9.6 feet adjacent to a former sump (boring 30). Although the hydrocarbon concentrations were below the screening levels, their vertical extent in soil adjacent to the sump had not been characterized and required further evaluation.
- Cooling Tower area – Cr (VI) and PCBs (Aroclor-1248) were detected in one soil sample from boring 46 at a depth of 21.1 feet bgs (the bottom of the boring). PCBs and Cr (VI) were not detected in shallow soil samples collected from boring 46, and therefore, further investigation of the source of PCBs and Cr (VI) detected at 21.1 feet bgs in soil was required.

### **3.3.2 Supplemental Phase II Investigations**

The Phase II remedial investigation results indicated a need to 1) assess the extent of impacted soil exceeding the screening criteria, 2) assess potential impacts to groundwater, and 3) further understand the subsurface conditions at the Site for each of the areas identified in Section 3.3.1. Therefore, a Supplemental Phase II investigation was required in specific areas of the Site to further characterize the extent of impacted soil and/or existing subsurface conditions for the reasons described above in Section 3.3.1. On March 9, 2006, Geomatrix submitted a proposed plan to the City of Vernon H&EC to further characterize the extent and potential significance of COPCs exceeding screening criteria in soil at the Site and the potential impacts to groundwater related to TCE detections in soil and soil vapor in Buildings 106 and 108. On March 20, 2006, the City of Vernon H&EC approved the Supplemental Phase II investigation plan, and the investigation was conducted between March 28, 2006 and April 24, 2006.

Based on the findings of the initial Supplemental Phase II investigation, a follow-up investigation was required to further characterize the extent of VOCs detected in soil, soil vapor, and groundwater in the north portion of the Site. In a letter to the City of Vernon H&EC dated May 9, 2006, Geomatrix identified additional sampling points in Buildings 106, 108, and 112. Under approval and direction from the City of Vernon H&EC, the additional investigation work began on May 11, 2006 and was completed on May 24, 2006. The findings of the Supplemental Phase II investigation were submitted to the City of Vernon H&EC in a report dated December 19, 2006 (Geomatrix, 2006c).

Soil data collected during the Supplemental Phase II investigation were evaluated using the stepped screening process discussed in Section 3.3.1, and sample locations where COPCs were detected above the screening levels are described in Section 3.6.

### **3.3.3 Geomatrix Concrete Characterization for PCBs as Aroclors**

In addition to the concrete testing conducted during the Phase II investigation, coring and testing of the concrete slabs and concrete transformer pads were performed during and after

above-grade demolition work to further characterize PCB-impacted concrete. PCBs were detected in concrete samples at "total Aroclor" concentrations (the sum of detected Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260) greater than 1 mg/kg in portions of Buildings 104, 106, 108, 110, 112, and 112A. A summary of PCBs as total Aroclor concentrations for the concrete samples is depicted on Figure 7. The results for all tested Aroclors (Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260) are provided in Appendix A.

### 3.4 AMEC SUPPLEMENTAL SOIL VAPOR TESTING

As a continuation of the remedial investigation work at the Site, Pechiney was directed by DTSC to conduct an off-site soil vapor survey at the intersection of Fruitland and Boyle Avenues near the northwest corner of the Site in July of 2009. DTSC required the work to assess the off-site extent of VOC concentrations in shallow soil vapor in the vicinity of former Building 106. In addition, and in order to meet DTSC's requirements for evaluating human health risk related to vapor intrusion, a shallow soil vapor survey was conducted within the footprint of Building 112A and to the west to the building in the vicinity of the former Stoddard solvent UST area. This work was required due to the lack of soil vapor data. The soil vapor survey was conducted to complete the HHRA for potential indoor air exposure to Stoddard solvent and associated compounds. The findings of this work are provided in this FS and tabulated analytical results are included in Appendix A. Sample locations are shown on Figure 6. Based on the off-site soil vapor testing conducted in July 2009, the sample results indicated the following:

- TCE and tetrachloroethene (PCE) were detected in all shallow soil vapor samples (locations 161 through 164) at depths of 5 and 15 feet. Other VOCs, 1,1,1-trichloroethane (1,1,1-TCA; location 163 at 15 feet) and 1,1-dichloroethene (1,1-DCE at sample location #164 at 15 feet) were detected in only one sample each. No other VOCs were detected.
- TCE soil vapor concentrations decreased to the north, northwest (with the exception of the 15-foot sample at 164), and west of the Site, while the PCE soil vapor concentrations increased. TCE and PCE soil vapor concentrations also increased with depth. Assuming the suspected on-site source area for the site-derived TCE is present in the northwest corner of the Site, a threefold decrease in the concentration of TCE in soil vapor was measured between the on-Site sample location 81 and the off-site sample location 162, approximately 60 feet north. This reduction in concentration was also observed to the west between on-Site sample location 82 and off-site sample location 164. Based on this observation, the site-derived VOCs will continue to decrease at further distances from the Site and co-mingle with other potential source(s) in a highly industrial area.
- The highest PCE soil vapor concentration was detected at the furthest point from the Site on Fruitland Avenue (at sample location 163, see Figure 2). At this sample location, the TCE concentration in the 15-foot sample also was higher than the 15-

foot sample results obtained for TCE at the two off-site sample locations (162 and 164) closer to the Site. The higher PCE concentrations at the off-site sample location suggest the presence of an off-site source or sources of VOCs. For example, sample locations 163 is approximately 140 feet northwest of the Site, and approximately 300 feet east of the former solvent recycling facility (referred to as Detrex Solvent Division Facility located on Fruitland Avenue and listed with a land use deed covenant in EnviroStor<sup>1</sup>). At this former facility, a soil removal action was conducted in 2001 to a depth of 20 feet in a localized area that exhibited elevated concentrations of PCE in soil (1100 mg/kg at 4 feet) and soil vapor (34 milligrams per liter at 20 feet) (URS, 2002). Other VOCs, TCE and 1,1,1-TCA, also were detected but at a much lower concentrations. In addition, a recent investigation conducted by Tetra Tech Inc. (May 2011) at a facility located on Fruitland Avenue, approximately 700 feet west of the Site also identified PCE and TCE in soil vapor. At this facility, PCE and TCE were detected in soil vapor at 5 and 20 feet below grade at concentrations up to 100 µg/L, with the highest concentration reported for PCE in a hazardous materials storage area.

- Calculated molar ratios of PCE to TCE (0.10 and 0.42) are an order of magnitude higher at three of the off-site soil vapor sample locations 162, 163, and 164. The molar ratios calculated for the on-site samples located in the suspected on-site source area ranged between 0.01 and 0.087. The distribution of PCE to TCE is presented graphically on Figures 8 and 9. The PCE to TCE molar ratios further suggest the probability of an off-site source or sources of PCE and TCE in the vicinity of the off-site sample locations 162, 163, and 164.

### **3.5 AMEC SUPPLEMENTAL GROUNDWATER TESTING**

Based on a request from DTSC, a groundwater sampling event was conducted at the Site in May 2011 for VOC and perchlorate testing. Monitoring wells AOW-6 and AOW-8 were redeveloped and sampled in May 2011. Monitoring well AOW-9 could not be developed or sampled due to a migratory bird nesting near the well location. Perchlorate and VOCs were not detected in the groundwater samples collected from AOW-6 and AOW-8. Analytical results from this sampling event are included in Appendix A, and the monitoring well locations are shown on Figure 2. Historically, groundwater samples from AOW-8 contained 1,2-DCA, TCE and chloroform, with TCE and 1,2-DCA detected above the respective maximum contaminant levels (MCLs). As discussed in Section 3.6, the presence of these compounds in groundwater may be attributed to an off-Site source, and the reduction in VOC concentrations to non-detected levels at AOW-8 indicates natural attenuation of VOCs is already occurring in groundwater beneath the Site.

### **3.65 AMEC SUPPLEMENTAL SOIL AND CONCRETE CHARACTERIZATION**

In July 2009, AMEC submitted a PCBNP (AMEC, 2009) to U.S. EPA for approval of a risk-based application for on-site remediation of PCB releases and disposal of PCB-remediation

<sup>1</sup> EnviroStor, February 2012

waste (soil and concrete). The PCBNP was prepared in compliance with the 40 CFR 761 (Subchapter R, TSCA), including applicable amendments (June 29, 1998, 40 CFR Parts 750 and 761, Disposal of Polychlorinated Biphenyls, Final Rule). Following U.S. EPA's review of the risk-based application, U.S. EPA required additional testing, which included the following:

- Collection and analysis of additional concrete cores for PCBs as Aroclors from 50 randomly selected concrete slab areas;
- Collection and analysis of soil directly beneath PCB-impacted concrete slabs (referred to as sub-slab soil samples), where the total Aroclor concentration of the concrete slab exceeded the then proposed remediation goal of 5.3 mg/kg for concrete; and
- Collection and analysis of additional soil and concrete for PCBs as Aroclors and dioxin-like PCB congeners to support the HHRA and proposed risk-based remediation goals for PCBs.

Specific protocols and sampling requirements were outlined in a draft Sampling and Analysis Plan (SAP; AMEC, 2010), which was submitted to U.S. EPA pursuant to its conditional approval of the PCBNP (U.S. EPA, 2010a). The SAP was approved with modifications by U.S. EPA on August 30, 2010. The sampling covered under the SAP was conducted between September 9, 2010 and October 18, 2010, with final laboratory analytical data received on November 8, 2010. The analytical results of the additional PCB (tested Aroclors and sum of detected Aroclors) concrete and soil sampling are provided in Appendix A; a summary of the total Aroclor concentrations for the 2010 concrete samples are shown on Figure 7.

### **3.67 AREAS OF IMPACT**

Although the screening criteria described in Section 3.3.1 are not intended to be remediation goals, one or more COPCs were detected in soil and/or concrete at concentrations above these screening criteria during the Phase II and Supplemental Phase II investigations conducted by Geomatrix and AMEC. The areas identified as impacted by one or more COPCs with concentrations exceeding these initial screening criteria are described below and sample locations are shown on Figures 6 and 7.

With the exception of storm water outfalls #6 and #7 and former hot well area, these areas were not previously identified as being impacted by VOCs or PCBs.

- Northern Portion of Buildings 106, 108, and 112 – TCE was detected in soil vapor, soil, and groundwater in the northwestern portion of the Site. Data collected to date indicate the likely presence of a source of VOCs in soil and groundwater in the northwest corner of Building 106. TCE and ~~tetrachloroethene~~ (PCE) concentrations detected in soil exceed the U.S. EPA Region IX SSL for the protection of groundwater (using a DAF20) in this area. TCE was detected in groundwater samples collected from a depth of approximately 150 feet bgs at concentrations



ranging from 72 to 420 µg/L. In addition, PCBs were detected in the concrete slab in portions of these buildings, and PCBs were detected in sub-slab soil samples at three discrete locations between Building 106 and 108 (sample locations 191, 193 and 195).

- Off-site Northwest of Building 106 – the investigation of off-site soil vapor concentrations to the northwest of Building 106, at the intersection of Fruitland and Boyle Avenues, identified TCE and PCE in shallow soil vapor samples at depths of 5 and 15 feet (sample locations 161 through 164; Figures 8 and 9). At these off-site locations, TCE soil vapor concentrations decreased to the north, northwest and west of the Site, while the PCE soil vapor concentrations increased. For comparison, the molar ratios of PCE to TCE (0.10 and 0.42) were an order of magnitude higher at three of the off-site soil vapor sample locations. The molar ratios calculated for the on-site samples from the suspected source area ranged between 0.01 and 0.087. The observed higher PCE concentrations and PCE to TCE molar ratios suggest the probability of an off-site source or sources of PCE and TCE in the vicinity of the off-site sample locations (162, 163, and 164).
- Southern Portion of Building 106 – aromatic VOCs, primarily benzene, were detected in soil and groundwater in the southern portion of the building at borings 125 and 135. Benzene was detected in groundwater samples at concentrations ranging from 2.8 to 3.3 µg/L. PCBs also were detected in the concrete slab at the southwest corner of this building, and at isolated locations within the sub-slab soil (sample locations S-1 and #39) underlying the concrete slabs.
- Storm Water Outfall #7 – PCBs were detected in soil at a depth of 5.7 feet bgs at boring 182.
- Existing and Former Vertical Pits in Building 104 – PCBs were detected in soil to a depth of 31 feet bgs at boring 98 and at depths between 10 and 71.5 feet bgs at borings 40, 94, 95, and 189.
- Northwestern Portion of Building 104 – PCBs were detected in the concrete slab at the northwest corner of the building. PCBs were not detected in soil samples from borings 115, 116, 117, 118, and 119 located in this area of the building or from the sub-slab sample locations 215 through 225.
- Saw Area in Building 104 – PCBs were detected in soil to a depth of 3 feet bgs at borings 41, 73, and 100 and from the sub-slab soil borings 228 through 233 and #236. PCBs also were detected in the overlying concrete slabs near these boring locations and surrounding the location of the saw.
- Former Hot Well area – PCBs were detected in soil at a depth of 2.7 feet bgs at boring 175.
- Building 112A and West of Building 112A – Stoddard solvent and associated VOC compounds (naphthalene, trimethylbenzenes, and xylenes) were detected in soil vapor at depths of 5 and 15 feet bgs.

- Former Scalper/Planar Area – PCBs were detected in soil at a depth of 0.8 feet bgs at boring 183.
- Near Storm Water Outfall #6 – copper and lead were detected at a depth of 6.2 feet bgs at former boring 47, and arsenic was detected at a depth of 6.0 feet bgs at boring 113. PCBs also were detected in soil at a depth of 4.5 feet bgs at boring 176.

In order to further evaluate these areas of impacted soil vapor, soil or concrete, the Phase II data, the Supplemental Phase II investigation data, and all other COPCs detected in soil and soil vapor at the Site were evaluated for potential human health risks using a screening-level HHRA pursuant to NCP 40 CFR 300.430(d)(1) and DTSC guidance documents. The screening-level HHRA is presented in Section 4.0. The potential impacts of these COPCs to groundwater are evaluated in Section 4.3.

### **3.8 GROUNDWATER IMPACTS AND NATURAL ATTENUATION**

Groundwater samples collected at the Site contain TCE at concentrations above the MCL, and based on Site data and the reported groundwater flow direction (west-northwest), there are at least three potential sources of TCE and VOCs in groundwater as described below.

Tabulated groundwater analytical results are included in Appendix A.

- Northwest portion of the Site: TCE impacts to groundwater in this portion of the Site may be attributed, to some degree, to historical manufacturing operations in the northwestern portion of the Site (e.g. Building 106 as described further in Section 3.6). This statement is based on the detection of TCE and other VOCs in the northwest portion of the Site in soil, soil vapor, and groundwater samples. In this area of the Site, TCE was detected in hydropunch groundwater samples from sample locations 125, 126, 132, 133, and 134 at concentrations ranging between 71 and 420 µg/L.
- Off-site Source(s) to the south, southeast, and southwest: TCE and other VOC impacts to groundwater in the southern portion of the Site, near the former Stoddard solvent USTs, may be attributed to an off-site source or sources. This statement is based on the fact that TCE or other related VOCs were not detected in soil and soil vapor samples collected in the southern portion of the Site. Historical records reviewed at the RWQCB and on GeoTracker<sup>2</sup>, suggest the presence of several off-site sources including the former Bethlehem Steel site, located upgradient of the Site (just south of Slauson Avenue – aka Vernon Parcels/Lots) and the former Trico site located southwest of the intersection of Boyle Avenue and Slauson Avenue (Environmental Audit Inc., 2009). In addition, detected concentrations of the chlorinated VOCs, 1, 2-DCA, chloroform, and TCE in groundwater in the southern portion of the Site (former monitoring wells AOW-3 and AOW-7 and existing monitoring wells AOW-8, and AOW-9; see Figure 2) have decreased (attenuated) since the initial sampling event in 1991.

<sup>2</sup> GeoTracker, February 2012

- Off-site source(s) to the east: TCE impacts to groundwater may be present to the east of the Site, beyond Alcoa Avenue. This is based on historical groundwater data collected from a former Alcoa monitoring well AOW-4, which was located in the northeast corner of the original Alcoa property (see Figure 2) near the intersection of Alcoa Avenue and Fruitland Avenue. During previous monitoring events, TCE was detected in the groundwater samples from monitoring well AOW-4 at concentrations up to 220 µg/L, indicating the presence of another potential regional source of TCE in groundwater east of the Site. In addition, the TCE concentrations reported for monitoring well AOW-4 decreased with time since the initial sampling event in 1990.

### **3.79 ABOVE-GRADE FACILITY DEMOLITION**

Facility above-grade and below-grade demolition is being conducted separately; the above-grade hazardous materials abatement and demolition work was completed at the Site in November 2006 under the direction of the City of Vernon H&EC. The concrete building slabs (including those impacted by PCBs) and surrounding pavements were not removed during the above-grade demolition work. These features remain in-place and will be removed as part of the below-grade demolition work. Additional testing of the concrete slabs for PCBs has been conducted and was summarized earlier in Section 3.3.3 and 3.5. A summary of the above-grade demolition work is included in the Above Grade Demolition Completion Report dated December 26, 2006 (Geomatrix, 2006d).

## **4.0 SCREENING-LEVEL HUMAN HEALTH RISK ASSESSMENT**

This section presents the SCM developed for the Site and the screening-level HHRA conducted to evaluate potential human health risks associated with exposures to COPCs pursuant to NCP 40 CFR 300.430(d)(1) and DTSC guidance documents. Ecological receptors were not evaluated because the Site and surrounding areas are highly industrialized, providing poor quality habitat for such receptors. Furthermore, U.S. Fish and Wildlife Service determined the Site was not located within the vicinity of any federally listed species, their designated critical habitat, or other Federal trust resources under their jurisdiction (February 1, 2010 email communication with Bill Miller of the U.S. Fish and Wildlife Service).

This screening-level HHRA was conducted for individual "Phase areas" at the Site. Phase areas were developed to facilitate future below-grade demolition work and the anticipated plans for future site use(s); which may include the construction and operation of a power plant and/or commercial/industrial facilities. The "Phase" terminology is not meant to represent a sequential order of implementation of the below-grade demolition, but describes the primary locations where the work will be conducted. The Phase I through VI areas related to the layout of the Site are briefly described below. The phase areas are shown on Figure 3.

- The Phase I and II areas cover the majority of the Site and include former Buildings 104, 106, 108, 110, 112, and the northern portion of Building 112A.
- The Phase III area includes the hot well/cooling tower area and adjacent pavements that are located outside the buildings, including the former UST area southwest of Building 112A known to contain Stoddard solvent-impacted soil. This area was separated further to distinguish the hot well/cooling tower area (the Phase IIIa area) from the Stoddard solvent-impacted former UST area (the Phase IIIb area).
- The Phase IV area includes former Building 112A and has known Stoddard solvent soil and soil vapor impacts.
- The Phase V area includes Parcel 6 located south of Building 112A.
- The Phase VI area includes the eastern parking lot and paved areas.

#### 4.1 SITE CONCEPTUAL MODEL

As described in U.S. EPA's "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (U.S. EPA, 1988), the purpose of a SCM is to describe what is known about chemical sources, migration pathways, exposure routes, and receptors at a Site. The SCM depicts the exposure pathways and the mechanisms by which a receptor may come into contact with COPCs in the environment. Using the U.S. EPA Risk Assessment Guidance for Superfund (U.S. EPA, 1989), potential exposure pathways applicable to the Site have been identified and addressed. An exposure pathway is defined by four elements (U.S. EPA, 1989):

- a source and mechanism of COPC release to the environment;
- an environmental medium of concern (e.g., air, soil) or transport mechanism (e.g., volatilization) for the released COPC;
- a point of potential contact with the medium of concern; and
- an exposure route (e.g., ingestion) at the contact point.

An exposure pathway is considered "complete" if all four of these elements are present. Only complete exposure pathways need to be evaluated for the purposes of a risk assessment. The characterization of the potential exposure pathways at the Site, based on existing information, is presented in the SCM (Figure 108).

There is no current use of the Vernon Facility, but the property is being purchased by the City of Vernon for commercial/industrial use with the potential for a portion of the Site to be used as a power plant. Based on U.S. EPA's directive requiring the consideration of reasonably anticipated future land use (U.S. EPA, 1995), potential future human receptors at the Site include commercial/industrial workers and construction workers involved in the future

construction and grading at the Site. The construction worker receptor is assumed to spend 100 percent of his time outdoors and encompasses potential exposure of future short-term utility maintenance workers. The commercial/industrial worker receptor is assumed to spend 100 percent of his time indoors or outdoors; exposure was evaluated separately for indoor and outdoor receptors. No other land use (i.e., residential) is reasonably anticipated for the Site based on the assumption that a deed-land use covenant will be issued for the property restricting zoning and use of the Site to commercial/industrial purposes. Furthermore, the City of Vernon zoning laws prohibits new residential development within the City of Vernon, further supporting a no-residential development scenario.

Various fate and transport mechanisms also may result in the off-site movement of some COPCs. COPCs in subsurface soil vapor may move laterally through fractures, utility conduits, or other preferential pathways; COPCs in groundwater may move off site with groundwater flow. Furthermore, COPCs in soil may move off site as wind-blown fugitive dust. This HHRA also considered off-site receptors such as workers at adjacent or nearby commercial/industrial facilities or short-term utility workers performing excavation and maintenance activities in adjacent roadways.

As discussed in Section 3.0, prior remedial investigations identified TPH, PCBs, VOCs, and metals in soil; PCBs in concrete; and VOCs in soil vapor and groundwater. The identification of potentially complete exposure pathways for the COPCs in each exposure medium is discussed below.

#### **4.1.1 Potential Exposure to COPCs in Soil**

According to the City of Vernon H&EC, the depth of future below-grade excavation at the Site will encompass the upper 15 feet of soil (City of Vernon H&EC letter dated February 6, 2007; City of Vernon, 2007). Exposure of future construction workers was therefore considered potentially complete within the upper 15 feet of soil. It was also assumed that these soils could be redistributed at the land surface during excavation and grading, creating potential future exposure to outdoor commercial/industrial workers. The exposure pathways considered potentially complete for COPCs in soil for both construction workers and outdoor commercial/industrial workers and evaluated in the HHRA include:

- incidental ingestion of soil;
- dermal contact with soil; and
- inhalation of particulates in ambient air.

Exposure also was considered potentially complete for the volatile COPCs in soil via inhalation of these compounds in ambient air for outdoor commercial/industrial workers and construction

workers and via inhalation of these compounds in indoor air for indoor commercial/industrial workers. Because soil vapor data are considered to be more appropriate than soil data for evaluating potential vapor exposure, soil vapor samples collected in each Phase area of the Site (except for the Phase VI area where VOCs were not detected in soil) were used instead of soil data to evaluate potential vapor movement to air and inhalation exposure (Section 4.1.4).

Off site, exposure to COPCs in on-site soil was considered potentially complete for outdoor commercial/industrial workers and utility maintenance workers through inhalation of particulates and VOCs in ambient air. Exposure may also be potentially complete for indoor commercial/industrial workers to VOCs moving into indoor air. However, for COPCs detected in on-site soil or soil vapor, the evaluation of on-site exposures was assumed to be protective of off-site exposures. Potential off-site exposure to site-related COPCs in soil vapor at the intersection of Fruitland and Boyle Avenues was evaluated separately, as described in Section 4.1.4 below.

#### **4.1.2 Potential Exposure to COPCs in Concrete**

Concrete present in former building slabs may be demolished on site, crushed, and reused as fill material in excavation and foundation removal areas. A letter from the City of Vernon H&EC dated February 6, 2007, required Pechiney to implement alternative criteria in addition to a risk-based approach for the reuse of PCB-impacted concrete as fill material (City of Vernon, 2007). To address this requirement, alternative criteria were developed on the basis of potential exposures to PCBs in crushed concrete. Potential exposures were considered for 1) construction workers who may be potentially exposed to PCBs in crushed concrete during construction at the Site; and 2) outdoor commercial/industrial workers, who may be exposed if crushed concrete is left uncovered at the surface. Exposure to PCBs in crushed concrete was considered potentially complete for these outdoor workers via the pathways identified above for exposure to COPCs in soil.

#### **4.1.3 Potential Exposure to COPCs in Groundwater**

Prior remedial investigations identified VOCs in groundwater beneath the Site, specifically at a depth of approximately 150 feet bgs in the first water-bearing unit (interpreted to be the upper portion of the Exposition aquifer). Because VOCs in groundwater have the potential to partition into the vapor phase and move into indoor or ambient air, inhalation of VOCs from groundwater was considered potentially complete for all receptors. Indoor inhalation was evaluated to be protective of all receptors. It was also assumed that, for VOCs detected in on-site groundwater, this evaluation would be protective of off-site exposures.

According to information provided by the City of Vernon H&EC, groundwater is produced off site from the Jefferson, Lynwood, Silverado, and Sunnyside aquifers at depths greater than

450 feet bgs (Section 2.3.2.2). On-site use of groundwater found in the first water-bearing unit will be restricted as part of the land use deed-covenant to be issued for the Site. Although groundwater from the first water-bearing unit is not used for potable supply, the RWQCB Basin Plan (RWQCB, 1994) designated groundwater in the Site vicinity for beneficial use. Therefore, the potential exposure to impacted site groundwater found in the upper portion of the Exposition aquifer will be evaluated. Furthermore, the potential threat of COPC movement from soil or concrete to groundwater will also be evaluated.

#### **4.1.4 Potential Exposure to COPCs in Soil Vapor**

Prior remedial investigations identified VOCs in soil vapor, specifically at depths of 5 and 15 feet bgs, in on-site Phase areas (e.g., in the Phase I, III and IV areas) and off site at the intersection of Fruitland and Boyle Avenues. Because VOCs in soil vapor have the potential to move into indoor or ambient air, inhalation of VOCs in soil vapor was considered potentially complete for all receptors. Furthermore, because soil vapor is considered a more appropriate medium than soil for assessing potential vapor movement to air, shallow soil vapor data were used in lieu of soil data to evaluate potential risks associated with vapor movement from the vadose zone. Potential indoor inhalation exposure to site-related VOCs in the off-site soil vapor sample locations was evaluated to be protective of potential off-site exposures.

Potential vapor movement of VOCs in groundwater to indoor air was also evaluated (as described in Section 4.1.3) to differentiate vadose zone from groundwater impacts.

## **4.2 DEVELOPMENT OF SCREENING LEVELS AND HUMAN HEALTH RISK ASSESSMENT**

Potential human health risks for indoor commercial/industrial workers, outdoor commercial/industrial workers, and construction workers were evaluated using screening levels as described herein. AMEC developed risk-based screening levels (RBSLs) protective of complete exposure pathways using the methodology presented by the Office of Environmental Health Hazard Assessment (OEHHA) for California Human Health Screening Levels (CHHSLs) (OEHHA, 2005), and accounting for recent OEHHA and DTSC guidance documents (OEHHA, 2009; DTSC, 2009). However, RBSLs were developed to be consistent with exposure parameters recommended by the Department of Toxic Substances Control (DTSC, 2005).

This screening-level HHRA followed guidelines specified in U.S. EPA and California Environmental Protection Agency (Cal-EPA) for the performance of risk assessments as specified in the following documents:

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), U.S. EPA, Office of Emergency and Remedial Response, December 1989 (U.S. EPA, 1989);

- Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities, Cal-EPA, Department of Toxic Substances Control (DTSC), Office of the Science Advisor, July 1992, corrected and reprinted, 1996 (DTSC, 1996);
- Preliminary Endangerment Assessment Guidance Manual, Cal-EPA, DTSC, 1999 (DTSC, 1999a); and
- Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil, OEHHA, updated January 2005 (OEHHA, 2005).

Other regulatory reference documents were used as appropriate to supplement the information in these documents.

#### 4.2.1 Data Evaluation

The analytical data used for the HHRA were those data collected prior to and during the Geomatrix Phase II, Supplemental ESAs, and recent sampling events as presented in Appendix A. Collectively, these data constitute the remedial investigation data for the Site. Data excluded from consideration are listed below.

- Metals in soil with concentrations less than site-specific background concentrations established pursuant to DTSC guidance (1997). The derivation of site-specific background concentrations is presented in Appendix B.
- Data for total recoverable petroleum hydrocarbons (TRPH) and undifferentiated TPH in soil. Because the specific hydrocarbon ranges associated with these non-discrete TPH mixtures are not understood, toxicity criteria based on values for specific hydrocarbon ranges from DTSC guidance (DTSC, 2009) could not be derived for these mixtures. Furthermore, because available RWQCB criteria for potential impacts to groundwater (RWQCB, 1996) are also based on specific hydrocarbon ranges, detected concentrations of TRPH and undifferentiated TPH in soil were not screened for potential leaching concerns. Potential hazards from exposure to the remaining TPH mixtures in soil and soil vapor were evaluated using toxicity criteria for specific hydrocarbon ranges as described in Appendix C. The remaining TPH mixtures were also evaluated for potential impacts to groundwater based on comparisons to RWQCB criteria (RWQCB, 1996) (Section 4.3).
- Data from soil samples collected below 15 feet bgs. Based on the SCM (Figure 810), direct exposure to COPCs in deep soil (greater than 15 feet bgs) is considered incomplete. However, data from all soil samples were used to evaluate potential future impacts to groundwater, with PCBs and several VOCs exceeding the screening criteria for potential impacts to groundwater and subsequently subjected to more detailed leaching and migration modeling analysis as described in Section 4.3.



- Data from soil samples no longer in place following excavations (including excavation of dip tanks, sumps, storm water outfall discharge areas, waste disposal pits, and USTs). These samples are marked as “excavated” or “E” in Appendix A.

The COPCs identified after data evaluation and carried through the quantitative HHRA are listed below. The COPCs identified in shallow soil (0 to 15 feet bgs) included:

- VOCs – acetone, benzene, n-butylbenzene, sec-butylbenzene, ethylbenzene, isopropylbenzene, isopropyltoluene, naphthalene, PCE, n-propylbenzene, TCE, toluene, 1,2,4-trimethylbenzene (1,2,4-TMB), 1,3,5-trimethylbenzene (1,3,5-TMB), total xylenes, m,p-xylenes, and o-xylene.
- Metals – arsenic, barium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, silver, thallium, vanadium, and zinc.
- TPH – TPH as gasoline, TPH as diesel, TPH as motor oil, TPH as Stoddard solvent, TEPH, c6-c10 hydrocarbons, c10-c20 hydrocarbons, c10-c28 hydrocarbons, and c21-c28 hydrocarbons.
- PCBs – Aroclor-1016, -1232, -1248, -1254, and -1260. Dioxin-like PCB congeners were also considered COPCs in shallow soil, but sampling for these congeners was limited and specifically conducted for comparative purposes. A separate evaluation was conducted with the available data to address the concern that such congeners may be present at the Site at more significant concentrations, in terms of potential human health risk, than the PCBs as Aroclor mixtures. Because of the limited data, dioxin-like PCB congeners were not included in HHRA calculations by Phase area, but were evaluated separately as discussed in Section 5.2.2.1.

Aroclor-1016, -1248, -1254, and -1260 were identified as COPCs in concrete. Dioxin-like PCB congeners detected in limited concrete samples were also considered COPCs but were evaluated separately for comparative purposes (as discussed in Section 5.2.2.1).

The COPCs identified in groundwater included benzene, chloroform, 1,1-dichloroethene (1,1-DCE), 1,2-DCA, dichloromethane (i.e., methylene chloride), ethylbenzene, PCE, TCE, toluene, TPH as gasoline, m,p-xylenes, and o-xylene.

The COPCs identified in shallow soil vapor (5 and 15 feet bgs) included chloroform, 1,2-DCA, 1,1-DCE, naphthalene, PCE, TCE, toluene, TPH as Stoddard solvent, 1,1,1-trichloroethane, 1,2,4-TMB, 1,3,5-TMB, m,p-xylenes, and o-xylene.

#### 4.2.2 Risk-Based Screening Levels

RBSLs were developed for each receptor (i.e., indoor commercial/industrial worker, outdoor commercial/industrial worker, and construction worker) for the media to which that receptor is exposed. The methodology used to develop the RBSLs is presented in Appendix C. Tables 1 through 3 present a summary of the RBSLs developed for each receptor for the COPCs in soil.

groundwater, and soil vapor, respectively. Notable modifications from the CHHSL methodology (OEHHA, 2005) to account for more current guidance (DTSC, 2009; OEHHA, 2009) and certain exposure pathways are described below.

**Lead** – As required by DTSC, RBSLs were developed for lead in soil using the U.S. EPA's Adult Lead Model (ALM) (U.S. EPA, 2005) for outdoor commercial/industrial workers and the DTSC's LeadSpread model (Version 7.0) (DTSC, 1999b) for construction workers. LeadSpread was used assuming construction work would not be performed by childbearing adults.

**TPH** – As required by DTSC, RBSLs were developed for non-discrete TPH mixtures at the Site following DTSC guidance for Evaluating Human Health Risks from Total Petroleum Hydrocarbons (DTSC, 2009). DTSC-recommended physiochemical properties and toxicity criteria for specific aliphatic and aromatic hydrocarbon ranges were incorporated in the development of RBSLs. RBSLs were developed for the non-discrete mixtures by determining the aliphatic and aromatic hydrocarbon ranges typically associated with each mixture (Total Petroleum Hydrocarbon Criteria Working Group [TPHCWG], 1998; Agency for Toxic Substances and Disease Registry [ATSDR], 1999) and weighting the RBSLs appropriately. For comparative purposes, AMEC also developed "worst-case" RBSLs assuming each TPH mixture is composed of 50% aliphatic and 50% aromatic hydrocarbons as described in DTSC guidance (DTSC, 2009), and using the most health-protective toxicity criteria of the discrete hydrocarbon groups associated with each mixture.

**VOCs** – As required by DTSC, inhalation pathways were not incorporated into the development of RBSLs for the VOCs in soil because volatilization of chemicals from the subsurface to ambient or indoor air was evaluated using soil vapor data exclusively and RBSLs developed for these data. In summary, the approach for evaluating VOCs for indoor and outdoor commercial/industrial workers and construction workers consisted of the following:

- RBSLs for VOCs in soil were developed for dermal contact with soil and soil ingestion exposures for the outdoor commercial/industrial worker and construction worker.
- RBSLs for VOCs in groundwater were developed for indoor inhalation exposures for the indoor commercial/industrial worker (using the 1991 Johnson & Ettinger model) (Johnson & Ettinger, 1991). Such RBSLs were considered protective of outdoor inhalation exposures for the outdoor commercial/industrial worker, construction worker, and off-site utility worker, and indoor inhalation exposures for off-site workers at adjacent or nearby commercial/industrial facilities.

- RBSLs for VOCs in soil vapor were developed for indoor inhalation exposures to the indoor commercial/industrial worker (using the 1991 Johnson & Ettinger model) (Johnson and Ettinger, 1991) and for outdoor inhalation exposures to outdoor commercial/industrial worker and construction worker. RBSLs for indoor inhalation exposures would also be protective of off-site exposures to indoor workers at adjacent or nearby commercial/industrial facilities, and outdoor utility workers within a trench (semi-confined air space).

**Off-site Use of Groundwater** – Potential use of groundwater was evaluated using available State or Federal ~~maximum contaminant levels (MCLs)~~ instead of RBSLs.

~~Tables 1 through 3 present a summary of the RBSLs developed for each receptor for the COPCs in soil, groundwater, and soil vapor, respectively.~~

#### 4.2.3 Risk Evaluation

The risk evaluation was conducted as a screening-level assessment to evaluate worst-case exposure scenarios and identify any chemicals contributing significantly to predicted cancer risks and noncancer hazard indexes (HI) (U.S. EPA, 1989). Risks from exposure to COPCs in soil and soil vapor were evaluated independently for each Phase area defined in Section 4.0. Potential vapor intrusion risks from VOCs in groundwater were evaluated on a site-wide basis, assuming VOCs could move laterally across Phase area boundaries before entering indoor air. Maximum concentrations of chemicals in soil, groundwater and soil vapor were identified by reviewing current and historical data. As described in OEHHA guidance (OEHHA, 2005), comparison of a chemical concentration to a CHHSL or RBSL can predict the lifetime excess cancer risk or noncarcinogenic hazard quotient (HQ) for exposure to that chemical in the exposure medium. A cancer risk ratio was calculated for exposure to each carcinogen by dividing the maximum chemical concentration by the appropriate cancer-based RBSL. Multiplying each risk ratio by the target risk level used in the development of the RBSL (i.e., one-in-one million or  $1 \times 10^{-6}$ ) then results in a predicted lifetime excess cancer risk for exposure to that chemical concentration. Similarly, for noncarcinogens, HQs were calculated by dividing the maximum chemical concentration by the appropriate noncancer-based RBSL and multiplying by the target HQ used in the development of the RBSL (i.e., 1). Cumulative effects from exposure to multiple chemicals were evaluated for each Phase area by summing the estimated chemical-specific cancer risks or HQs by exposure medium (soil and soil vapor), and then summing across these media to estimate cumulative exposure within each Phase area.

Concrete impacted with PCBs was not included in the cumulative risk evaluation. With crushed concrete proposed for re-use (or on-site disposal) at the Site as potential fill materials, potential exposure to PCB-impacted concrete was evaluated separately using the RBSLs

calculated for PCBs in soil. Concentrations of Aroclor mixtures in concrete that exceeded their respective RBSLs were identified in the following Phase areas (Appendix A).

- Phase I Area: Concentrations of Aroclor-1248, -1254, and -1260 were found to exceed the outdoor commercial/industrial worker and construction worker cancer-based RBSLs (0.53 and 3.5 mg/kg, respectively). Concentrations of Aroclor-1254 were also found to exceed the construction worker noncancer-based RBSL (2.0 mg/kg).
- Phase II Area: Concentrations of Aroclor-1248 and -1260 were found to exceed the outdoor commercial/industrial worker and construction worker cancer-based RBSLs (0.53 and 3.5 mg/kg, respectively).
- Phase IV Area: One detected concentration of Aroclor-1254 was found to exceed the outdoor commercial/industrial worker cancer-based RBSL (0.53 mg/kg).

Concentrations of dioxin-like PCB congeners in concrete were evaluated separately for comparison to the above results. Sampling for these congeners was limited and specifically collected for comparative purposes to address the concern that, based on the age of the facility and the historical manufacturing operations, the dioxin-like congeners may be present at the Site at more significant concentrations, in terms of potential human health risk, than the PCBs as Aroclor mixtures. Details of this separate evaluation are provided in Section 5.2.2.1.

Potential off-site exposure to COPCs in groundwater and off-site soil vapor were also evaluated separately. Detected concentrations of COPCs in site groundwater samples are presented in Appendix A, along with the available State or Federal MCLs. Detected groundwater sample concentrations of benzene, chloroform, 1,2-DCA, dichloromethane, and TCE exceed their respective MCLs during one or more sampling events. With the exception of dichloromethane, these COPCs were detected in groundwater as recent as the last 2006 sampling event in 2006 (URS, 2006). In addition, detected soil vapor concentrations of PCE and TCE in off-site soil vapor (Appendix A) were found to exceed the indoor commercial/industrial worker cancer-based RBSLs (2.2 and 6.3 µg/L, respectively).

U.S. EPA and DTSC guidance on exposure levels considered protective of human health was used to aid in the interpretation of the HHRA results. In the NCP 40 CFR 300.430(e)(i), U.S. EPA defined general remedial action goals for CERCLA sites. The goals included a range for residual cancer risk, which is "an excess upper-bound lifetime cancer risk to an individual of between  $10^{-4}$  [1E-04] and  $10^{-6}$  [1E-06], or 1 in 10,000 to 1 in 1,000,000. The goals set in the NCP 40 CFR 300.430(e)(i)(A)(2) are applied after a decision has been made to remediate a site. A more recent U.S. EPA directive (U.S. EPA, 1991) provides additional guidance on the role of the HHRA in supporting risk management decisions, and in particular, determining whether remedial action is necessary at a site. Specifically, the guidance states, "Where

cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than  $10^{-4}$ , and the noncancer HQ is less than 1, action generally is not warranted unless there are adverse environmental impacts." U.S. EPA Region IX has stated, however, that action may be taken to mitigate risks between  $10^{-6}$  and  $10^{-4}$ , and the DTSC has established  $10^{-6}$  as the "point of departure" for cumulative lifetime excess cancer risks in the State of California. ~~For that reason, the range between  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$  is referred to as the "risk management range" in this HHRA.~~

The results of the screening-level HHRA for chemicals present in soil, groundwater, and soil vapor are presented in Tables 4 through 20 and discussed below. As is standard practice in risk assessment (U.S. EPA, 1989), this section also provides an analysis of the uncertainty in the risk-based screening process.

#### 4.2.3.1 Non-Lead Exposures

Using maximum chemical concentrations in soil, the screening-level HHRA resulted in the predicted lifetime excess cancer risks and noncancer HQs for indoor commercial/industrial workers, outdoor commercial/industrial workers, and construction workers presented in Tables 4 through 10, and summarized in Table 11. Using maximum chemical concentrations in groundwater, the screening-level HHRA resulted in the predicted lifetime excess cancer risks and noncancer HQs for indoor commercial/industrial workers presented in Table 12. Using maximum chemical concentrations in soil vapor, the screening-level HHRA resulted in the predicted lifetime excess cancer risks and noncancer HQs for indoor commercial/industrial workers, outdoor commercial/industrial workers, and construction workers presented in Tables 13 through 17, and summarized in Table 18. The predicted lifetime excess cancer risks and noncancer HIs for cumulative soil and soil vapor exposures in each Phase area are presented in Table 19.

As presented in Table 12, for vapor intrusion from groundwater to indoor air, the predicted lifetime excess cancer risk for indoor commercial/industrial workers is ~~within the risk management range~~ above the DTSC point of departure ( $1 \times 10^{-6}$ ), but below the cumulative target cancer risk level of  $1 \times 10^{-5}$ ; ~~proposed for the Site as described in Section 5.2 commonly used as the target risk level for commercial/industrial sites overseen by the DTSC below.~~

As presented in Table 19, for cumulative soil and soil vapor exposures, the predicted lifetime excess cancer risks for the indoor commercial/industrial worker in the Phase I area; and the outdoor commercial/industrial worker and construction worker in the Phase I, and Phase II, Phase IIIa, Phase IV, and Phase VI areas; ~~and the construction worker in the Phase I and Phase II areas~~ are above the DTSC risk management range point of departure ( $1 \times 10^{-6}$ ). The other cancer risks estimated were either within or below this risk management range  $1 \times 10^{-6}$ .

The maximum predicted noncancer HIs for the indoor commercial/industrial worker in the Phase I, Phase IIIb, and Phase IV areas; the outdoor commercial/industrial worker in the Phase II and Phase IV area; and the construction worker in the Phase II, Phase IIIa, Phase IIIb, Phase IV, and Phase VI areas are above the ~~acceptable range~~ DTSC point of departure for noncarcinogenic effects (less than or equal to 1). The other HIs estimated for cumulative soil and soil vapor exposures were all at or below 1, with the majority well below 1. In summary, maximum concentrations of chemicals resulted in risks or hazard indexes above target levels in the Phase I, Phase II, Phase IIIa, Phase IIIb, Phase IV, and Phase VI areas for one or more receptors.

Certain chemicals in soil and soil vapor individually contributed cancer risk levels of at least  $1 \times 10^{-6}$  or HQs of at least 1. These were considered key chemicals in each Phase area. Specifically, the following key chemicals were identified in soil and soil vapor, as presented in Tables 4 through 10 (key chemicals in soil) and Tables 13 through 17 (key chemicals in soil vapor) and as described below.

- Phase I area: Aroclor-1248 and -1260 in soil for both outdoor commercial/industrial workers and construction workers (Table 4); chloroform, PCE, and TCE in soil vapor for indoor commercial/industrial workers (Table 13).
- Phase II area: Aroclor-1232 in soil for outdoor commercial/industrial workers; Aroclor-1248, -1254, and -1260 in soil for both outdoor commercial/industrial workers and construction workers; chromium in soil for construction workers (Table 5).
- Phase IIIa area: Aroclor-1248, -1254, and arsenic in soil for both outdoor commercial/industrial workers and construction workers; Aroclor-1260 in soil for outdoor commercial/industrial workers (Table 6).
- Phase IIIb area: c6-c10 hydrocarbons in soil for construction workers (Table 7); TPH as Stoddard solvent, 1,2,4-TMB, and 1,3,5-TMB in soil vapor for indoor commercial/industrial workers (Table 15).
- Phase IV area: Aroclor-1248, -1254, -1260, and arsenic in soil for outdoor commercial/industrial workers; Aroclor-1254, arsenic, cobalt, and c6-c10 hydrocarbons in soil for construction workers (Table 8); TPH as Stoddard solvent, 1,2,4-TMB, and 1,3,5-TMB in soil vapor for indoor commercial/industrial workers (Table 16).
- Phase VI area: Aroclor-1260 and arsenic in soil for outdoor commercial/industrial workers; arsenic in soil for construction workers (Table 10).

#### **4.2.3.2 Exposure to Lead in Soil**

Exposure to lead in soil was evaluated independently of exposure to the other COPCs. As described in detail in Appendix C, the RBSLs for lead in soil, developed using the U.S. EPA's

ALM (U.S. EPA, 2005) or DTSC's LeadSpread (DTSC, 1999b), are based on blood-lead as a biomarker for potential health concerns. In contrast, the RBSLs for all other COPCs are based on chemical intake and chemical-specific toxicity factors.

Table 20 presents the results of comparing the maximum detected concentrations of lead in each Phase area to the RBSLs developed for commercial/industrial worker or construction worker exposures. The comparisons are presented as "risk ratios," with a ratio higher than 1 indicating that the RBSL is exceeded. As presented in Table 20, the maximum detected concentrations of lead in soil in the Phase I, Phase IIIb, Phase V, and Phase VI areas were below background. The maximum detected concentration of lead in soil in the Phase II, Phase IIIa, and Phase IV areas were above background, but they did not exceed the RBSLs for the outdoor commercial/industrial worker or the construction worker. Based on this analysis, the concentrations of lead detected in soil at the Site are not considered to be significant with respect to potential health effects.

#### **4.2.3.3 Uncertainty**

Uncertainty is inherent in many aspects of the risk assessment process, and generally arises from a lack of knowledge of 1) site conditions, 2) toxicity and dose-response of the COPCs, and 3) the extent to which an individual will be exposed to those chemicals (U.S. EPA, 1989). This lack of knowledge means that assumptions must be made based on information presented in the scientific literature or professional judgment. While some assumptions have significant scientific basis, others have much less. Pursuant to U.S. EPA requirements (U.S. EPA, 1989), the assumptions that introduce the greatest amount of uncertainty and their effect on the noncarcinogenic and carcinogenic risk estimates must be included as part of the HHRA. The uncertainty associated with the development of RBSLs is presented in Appendix C. Uncertainty relative to data evaluation and the RBSL comparison is included herein.

- The identification of site-related COPCs was based upon the results of the sampling and analytical programs established for the Site. The factors that contribute to the uncertainties associated with the identification of COPCs are inherent in the data collection and data evaluation processes, including appropriate sample locations, adequate sample quantities, laboratory analyses, data validation, and treatment of validated samples.
- The predominant sources of uncertainty and potential bias associated with site characterization are based on the procedures used for site investigation (including sampling plan design and the methods used for sample collection, handling, and analysis) and from the procedures used for data evaluation. A relatively comprehensive sampling program was implemented to account for the chemicals most likely to be present at the Site as a result of site history and past activities. Certain assumptions were made in the interpretation of the available data for the HHRA. For example, available TPH data reported as non-discrete mixtures (TPH as gasoline, TPH as Stoddard solvent, TPH as diesel, TPH as motor oil, and

~~TEPH~~total extractable petroleum hydrocarbons) were evaluated in the context of specific aliphatic and aromatic hydrocarbon ranges. In the absence of site-specific speciation data, it was assumed that the aliphatic and aromatic hydrocarbon ranges reported by the TPHCWG (TPHCWG, 1998) and the ATSDR (ATSDR, 1999) for these types of mixtures were applicable to reported concentrations. For comparative purposes, it was alternatively assumed the TPH mixtures consisted of 50% aliphatic and 50% aromatic hydrocarbons and that the most health-protective hydrocarbon toxicity criteria would be applicable to the mixtures (Appendix C). This assumption may be conservative for the Site, given the age of the available TPH data (the majority was collected in the 1990s) and the effects of weathering which contribute to reduced concentrations of the lighter, more toxic hydrocarbons over time.

- The use of maximum detected concentrations in the screening-level HHRA represent worst-case conditions and are representative of conditions in the most impacted areas of the Site.
- One source of uncertainty that is unique to risk characterization is the assumption that the total risk associated with exposure to multiple chemicals is equal to the sum of the individual risks for each chemical (i.e., the risks are additive). Other possible interactions include synergism, where the total risk is higher than the sum of the individual risks, and antagonism, where the total risk is lower than the sum of the individual risks. Relatively little data are available regarding potential chemical interactions following environmental exposure to chemical mixtures. Animal studies suggest, however, that synergistic effects will not occur at levels of exposure below their individual effect levels (Seed, et al., 1995). As exposure levels approach the individual effect levels, a variety of interactions may occur, including additive, synergistic, and antagonistic (Seed, et al., 1995). Current U.S. EPA guidance for risk assessment of chemical mixtures (U.S. EPA, 1989) recommends conducting the risk assessment assuming an additive effect following exposure to multiple chemicals (excluding lead, given the different means by which potential health concerns are evaluated). Subsequent recommendations by other parties, such as the National Academy of Sciences (National Research Council, 1988) and the Presidential/Congressional Commission on Risk Assessment and Risk Management (Risk Commission, 1997) have also advocated a default assumption of additivity. As currently practiced, risk assessments of chemical mixtures generally sum cancer risks regardless of tumor type and sum noncancer hazard indices regardless of toxic endpoint or mode of action.

In summary, these and other assumptions contribute to the overall uncertainty in the development of RBSLs. However, given that the largest sources of uncertainty generally result in overestimates of exposure or risk, it is believed that results presented in this document are based on conservative estimates.

#### **4.3 SOIL CONDITIONS FOR PROTECTION OF GROUNDWATER**

In addition to the human health exposure evaluation presented in Section 4.2, COPCs in soil were also evaluated for potential impacts to groundwater. COPCs detected in shallow and deeper soils (below 15 feet bgs) were evaluated with respect to a potential threat to



groundwater using the groundwater protection screening levels described in Section 3.3.1. Specifically, RWQCB screening criteria for TPH and BTEX compounds and U.S. EPA Region IX SSLs were used as available for COPCs detected in soil at the Site. Metals were not evaluated for such concerns because of their comparative lack of mobility. COPCs with soil concentrations that exceeded available screening levels for the protection of groundwater quality (Appendix A) are described below by Phase area.

- Phase I Area - TCE, PCE, 1,2-DCA, benzene, and toluene were detected in soil at concentrations above their respective screening levels for the protection of groundwater quality (these five COPCs were also detected in groundwater observed at a depth of 150 feet bgs in this portion of the Site, beneath Buildings 106, 108, and 112).
- Phase IIIa Area – In one sample, IWDP-N at 10 feet bgs (excavation side wall sample), TPH as c10-c20 hydrocarbons and c21-c28 hydrocarbons were detected in soil at concentrations above RWQCB criteria for TPH as diesel (used as a surrogate criterion for c10-c20 hydrocarbons) or TPH as residual fuel (used as a surrogate criterion for c21-c28 hydrocarbons). As described in Section 3.2, soil from this location (referred to as the inert-waste disposal pit) was previously excavated, and soil removal was terminated due to the proximity of the railroad tracks along the south and west sides of the excavation.
- Phase IIIb Area – Benzene, toluene, and xylenes were detected in soil at concentrations above their respective screening levels. Furthermore, TPH as specific carbon ranges were detected in soil at concentrations above RWQCB criteria for TPH as gasoline (used as a surrogate criterion for c5-c10 hydrocarbons, c6-c10 hydrocarbons, and c7-c12 hydrocarbons) and TPH as diesel (used as a surrogate criterion for c10-c20 hydrocarbons and c10-c28 hydrocarbons).
- Phase IV Area – BTEX were detected in soil at concentrations above their respective screening levels. Furthermore, c6-c10 hydrocarbons and Stoddard solvent were detected in soil at concentrations above the surrogate RWQCB criterion for TPH as gasoline and c10-c20 hydrocarbons and c10-c28 hydrocarbons were detected in soil at concentrations above the surrogate RWQCB criterion for TPH as diesel.

Additional COPCs detected in soil for which the initial soil screening levels for the protection of groundwater were not available include 1,2,4-TMB, 1,3,5-TMB, isopropylbenzene, isopropyltoluene, n-butylbenzene, n-propylbenzene, sec-butylbenzene, and PCBs. One or more of these compounds were detected in soil in the Phase I through Phase IV areas.

Following this initial screening, site-specific soil screening levels for the protection of groundwater were developed for the VOCs identified above the initial screening levels or for which such screening levels were not available using a chemical attenuation analysis. Development of these site-specific screening levels was based on the MCL or the California Department of Public Health (DPH) notification level of these chemicals. The site-specific soil

screening levels were estimated as a function of depth from the ground surface, based on site lithology, using the Attenuation Factor (AF) method developed by the Los Angeles RWQCB (RWQCB, 1996). The chemical attenuation analyses performed for the selected VOCs and the resulting site-specific soil screening levels are described further in Section 4.3.1 below.

Because PCBs have a significantly higher soil sorption factor than the compounds addressed in the RWQCB's AF method, it is inappropriate to use the AF method to establish soil screening levels for PCBs. Instead, numerical modeling was performed to simulate the fate and transport of PCBs in a one-dimensional soil column in the vadose zone. The analyses performed for PCBs and the resulting site-specific soil screening levels are described further in Section 4.3.2 below.

Because MCLs or California DPH notification levels are not available for carbon range-specific TPH in groundwater, site-specific soil screening levels for TPH were not established using the AF or modeling methods. Therefore, the initial RWQCB screening criteria for TPH was used as the site-specific soil screening levels for the protection of groundwater (RWQCB, 1996).

#### **4.3.1 Site-specific Screening of Selected Volatile Organic Compounds in Soil for Protection of Groundwater**

As described above, the site-specific soil screening levels for the protection of groundwater for selected VOCs were estimated following the procedures based on the AF method described in the Los Angeles RWQCB guidance (RWQCB, 1996). The lithologic profile, classified as a mixture of gravel, sand, silt, and clay, was based on the logs of borings 125 and 126, advanced to groundwater at the Site (approximately 150 feet bgs) by Geomatrix. Because similar lithology has been encountered throughout the Site as described in Section 2.3.2.1, the lithologic profile developed from these two borings was considered representative of site-wide conditions. The calculations were implemented in Mathcad® (Parametric Technology Corporation, 2007) worksheets and are presented in Appendix D with the depth-specific screening levels summarized in Table 21.

Several soil concentrations of VOCs (Appendix A) were identified as exceeding the estimated site/depth-specific soil screening levels for the protection of groundwater. Specifically, VOCs in the following Phase areas were detected at concentrations in soil above their respective depth-specific screening levels.

- Phase I Area – TCE, PCE, 1,2-DCA, benzene, and toluene
- Phase IIIb area – Benzene
- Phase IV Area – BTEX

#### 4.3.2 Site-specific Screening of PCBs in Soil and Concrete for Protection of Groundwater

PCBs in soil and concrete were evaluated for potential impacts to groundwater using a numerical modeling method based on the MCL of these chemicals. The modeling approach and results are summarized below. A more detailed description of the model construction, input parameters, and resulting calculations is provided in Appendix D.

Numerical modeling was performed using the commercial software MODFLOW-SURFACT developed by HydroGeologic, Inc. (HydroGeologic, Inc., 2006). This code is based on the most commonly used groundwater modeling software, MODFLOW (Harbaugh et al., 2000), with an additional capability to simulate the vadose zone using the Van Genuchten model. MODFLOW-SURFACT is similar to the one-dimensional vadose zone transport model, VLEACH (Ravi and Johnson, 1994).

Consistent with the modeling of VOCs described in Section 4.3.1 above, the lithologic profile used in the PCB modeling was also based on the logs of on-site borings 125 and 126. Thirty 5-foot-thick soil layers were used to represent the 150-foot-thick vadose zone and a 50-foot-thick layer at the bottom was used to represent the saturated zone in the model. For each boring log, the percentages of gravel, sand, silt, and clay in each model layer were computed by averaging the percentages at the two boring locations. The hydrogeologic parameters and Van Genuchten's model parameters were estimated using the computer code ROSETTA developed by the Salinity Laboratory of the United States Department of Agriculture (U.S. Salinity Laboratory, 2000).

MODFLOW-SURFACT was then used to estimate site-specific attenuation factors for PCBs at various source depths in soil. Specifically, attenuation factors for PCBs at hypothetical source depths of 15 feet, 30 feet, and 45 feet bgs were estimated by simulating the movement of PCBs in pore water from these depths to pore water immediately above the water table (at approximately 150 feet) after 500 years. The attenuation factors calculated with this method ranged from  $2.2 \times 10^{44}$  to  $1 \times 10^{46}$  for the three source depths. These attenuation factors were then used in a reverse calculation from the MCL, 0.5 µg/L, to estimate the source pore water concentrations at 15 feet, 30 feet, and 45 feet bgs that would be necessary to pose a potential threat to groundwater quality. The estimated source pore water concentrations ranged from  $1.1 \times 10^{41}$  to  $5 \times 10^{42}$  mg/L. Based on these calculations, the concentration of PCBs (as total Aroclors) in source pore water at the Site would need to exceed  $1.1 \times 10^{41}$  mg/L at 45 feet bgs or  $5 \times 10^{42}$  mg/L at 15 to 30 feet bgs to result in groundwater concentrations exceeding the MCL. Because these concentrations greatly exceed the solubility limit of PCBs in water (0.7 mg/L; U.S. EPA, 1996) and exceed the concentration of pure phase PCBs ( $1 \times 10^6$  mg/L), it is physically impossible to achieve total Aroclor concentrations in the source pore water that

would result in a concentration of total Aroclors exceeding the MCL in groundwater. Therefore, PCBs in soil at the Site do not pose a potential threat to groundwater at the Site.

Because crushed concrete containing PCBs may be re-used as on-site fill materials (as restricted and unrestricted use) within the upper 15 feet of the vadose zone, the reverse calculation method described above was also used to verify that PCBs in concrete do not pose a potential threat to groundwater quality. The MODFLOW-SURFACT simulation was performed in the same manner as described above for soil, but modified to account for the physical properties associated with crushed concrete. For crushed concrete, gravel (approximating the properties for crushed concrete) was used for the hydrogeologic parameters and Van Genuchten's model parameters rather than the lithologic parameters estimated for the upper 15 feet of the soil column. Assuming a source depth of 15 feet bgs (corresponding to the bottom depth of proposed concrete re-use), an attenuation factor of  $1 \times 10^{46}$  was estimated, which is equal to the attenuation factor estimated for PCBs in native soil at 15 or 30 feet bgs. Correspondingly, the source pore water concentration of total Aroclors dissolved from crushed concrete at 15 feet bgs would need to exceed  $5 \times 10^{42}$  mg/L to result in groundwater concentrations exceeding the MCL. This source pore water concentration greatly exceeds the solubility limit of PCBs in water (0.7 mg/L; U.S. EPA, 1996) and exceeds the concentration of pure phase PCBs ( $1 \times 10^6$  mg/L). As such, it is physically impossible for this source pore water to exhibit a total Aroclor concentration exceeding the MCL in groundwater. Therefore, PCBs in concrete that may be re-used as on-site (restricted and unrestricted) fill materials also do not pose a potential threat to groundwater at the Site.

As confirmation of the modeling results presented above, the PCB attenuation model was run using a forward simulation approach. The model was re-run using the modeling parameters noted above for PCBs in soil at depths of 15, 30 and 45 feet bgs (Figure 11) and crushed concrete at a depth of 15 feet bgs (Figure 12). At all three depths, the modeled PCB concentrations in soil were reduced to non-detect levels at a shallow depth regardless of the duration. A similar outcome was obtained for the modeled PCB concentrations in crushed concrete at a depth of 15 feet bgs.

Also, to address concerns regarding potential colloid-facilitated transport or cosolvency effects, sensitivity analysis simulations were performed where the retardation factor for PCBs was reduced by one order of magnitude (i.e., 10 percent of the value). The simulated concentration profiles over time for PCBs in soil at depths of 15, 30, and 45 feet bgs and crushed concrete at a depth of 15 feet are shown on Figures 11 and 12. Although changing the retardation rate increased the migration rate of PCBs through the soil column, the resulting increased migration rate was not fast enough to cause an impact to groundwater.

Neither the sensitivity analysis nor the forward simulation modeling results changed the conclusions presented above. Therefore, PCBs in soil that will remain in place below a depth of 15 feet bgs or in crushed concrete used for backfill that contains PCBs below the remediation goal (at concentrations between 1 mg/kg and 3.5 mg/kg) do not pose a potential threat to groundwater at the Site.

## **5.0 REMEDIATION OBJECTIVES AND SCENARIOS FOR FS EVALUATION**

Based on the results of the screening risk assessment [NCP 40 CFR 300.430(d)(4)], this section describes the RAOs, COCs developed from COPCs, site-specific risk-based and other remediation goals (referred to herein as site-specific remediation goals) for the COCs, and areas of the Site where the COC concentrations in soil, soil vapor, and concrete are above the site-specific remediation goals.

### **5.1 REMEDIAL ACTION OBJECTIVES**

RAOs are general risk management goals for protecting human health and the environment. The RAOs for the Site are listed below.

- Mitigate shallow soil vapor impacted with COCs above site-specific remediation goals established for future Site use for the protection of commercial/industrial workers occupying buildings that may be affected by vapor intrusion.
- Mitigate shallow soil impacted with COCs above the site-specific remediation goals established for future Site use of soils to a depth of 15 feet for the protection of future construction workers or some future commercial/industrial Site workers.
- Mitigate PCB-impacted concrete for the protection of human health.
- Mitigate deeper soils (depths greater than 15 feet) impacted with COCs at concentrations above the site-specific remediation goals established for the protection of groundwater and to support monitored natural attenuation of VOCs detected in groundwater beneath the Site.

To meet the RAOs for the Site, site-specific remediation goals were established, and COC-impacted areas were identified as discussed in the following sections. In addition, future site uses are proposed to be restricted pursuant to a land use deed-covenant (i.e., prohibit residential development and use of groundwater from the first water-bearing unit within the site perimeter).

### **5.2 SITE-SPECIFIC REMEDIATION GOALS**

Based on the results of the screening-level HHRA for COPCs present in soil, concrete, groundwater, and soil vapor (Section 4.2), and an evaluation of soil and concrete conditions for the protection of groundwater (Section 4.3), several COCs were identified that require

mitigation. In shallow soil (upper 15 feet of the vadose zone), arsenic, chromium, cobalt, PCBs, and TPH in soil were identified as key chemicals contributing significantly to potential risk or hazards in certain Phase areas of the Site (Section 4.2.3.1). As further discussed in Section 5.2.2.3, arsenic, PCBs, and TPH were identified as COCs in soil. PCBs were also identified as COCs in concrete building slabs for the proposed reuse of the crushed concrete as fill material in the upper 15 feet of the vadose zone. VOCs were identified as COCs in groundwater based on concentrations that exceed MCLs. Finally, VOCs were also identified as COCs in soil vapor with the potential to pose future vapor intrusion risks at the Site. A summary of the COCs requiring mitigation and the site-specific remediation goals developed for the COCs are described in the subsections below.

Because future use of the Site will be commercial/industrial (not residential), a cumulative target cancer risk level of  $10^{-5}$  is proposed and was used in the development of remediation goals protective of potential cancer risks. This target risk level is the mid-point of the risk management range recommended by U.S. EPA ( $10^{-6}$  to  $10^{-4}$ ), and is the risk level at or above which notification is required under the Proposition 65 and Air Toxic Hot Spots programs in California (OEHHA, 2001; 2003; and 2004). In addition,  $10^{-5}$  is commonly used as the target risk level for commercial/industrial sites overseen by DTSC with the issuance of a land use covenant. For potential noncarcinogenic effects, a cumulative target HI of 1 was used in the development of remediation goals. Both targets were set as "acceptable" levels for cumulative chemical exposure related to commercial/industrial re-use of the Site with the issuance of a land use covenant, in coordination with the U.S. EPA risk management team responsible for approval of the risk-based application for PCBs (conference call held with DTSC and U.S. EPA on April 27, 2010).

### 5.2.1 Indoor Air Exposure

Chloroform, PCE, and TCE in shallow soil vapor (5 and 15 feet bgs) in the Phase I area contributed significantly to potential risk or hazards for future indoor commercial/industrial workers. These VOCs did not pose a significant cancer risk or noncancer hazard for future outdoor workers (outdoor commercial/industrial workers or construction workers). These COCs were therefore only identified as COCs for potential indoor inhalation exposures under future commercial/industrial use. Shallow soil vapor remediation goals were established for these three COCs to mitigate potential exposures to a future indoor commercial/industrial worker (applicable to soil vapor within 15 feet bgs). Using the cancer-based RBSLs protective of a  $10^{-6}$  risk of indoor commercial/industrial worker exposure (2.0 µg/L, 2.2 µg/L, and 6.3 µg/L for chloroform, PCE, and TCE, respectively [Table 3]), remediation goals were derived protective of one-in-one hundred thousand ( $10^{-5}$ ) risk from cumulative exposure to these VOCs (6.7 µg/L, 7.3 µg/L, and 21 µg/L, respectively). ~~Because future use of the Site will be commercial/industrial (not residential), a cumulative target cancer risk level of  $10^{-5}$  was~~

~~proposed. This target risk level is the mid-point of the risk management range recommended by U.S. EPA ( $10^{-6}$  to  $10^{-4}$ ), and is the risk level at or above which notification is required under the Proposition 65 and Air Toxic Hot Spots programs in California (OEHHA, 2001; 2003; 2004). In addition,  $10^{-5}$  is commonly used as the target risk level for commercial/industrial sites overseen by DTSC.~~

Remediation goals were also derived for chloroform, PCE, and TCE in shallow soil vapor using the noncancer-based RBSLs protective of a chemical-specific, noncancer HQ of 1 (1100 µg/L, 170 µg/L, and 2700 µg/L for chloroform, PCE, and TCE, respectively [Table 3]). These remediation goals were derived to be protective of a cumulative HI of 1 (367 µg/L, 56.7 µg/L, and 900 µg/L for chloroform, PCE, and TCE, respectively). Because the remediation goals derived from the cancer-based RBSLs are universally more conservative, these values were established as the final remediation goals for these VOCs under future commercial/industrial use as summarized in Table 22. Chloroform, PCE, and TCE are at concentrations in shallow soil vapor that exceed these remediation goals at the northern portion of Buildings 106, 108, and 112 (Figure 139).

TPH as Stoddard solvent, 1,2,4-TMB, and 1,3,5-TMB in shallow soil vapor (5 and 15 feet bgs) in the Phase IIIb and Phase IV areas contributed significantly to potential hazards for future indoor commercial/industrial workers. These VOCs did not pose a significant noncancer hazard for future outdoor workers (outdoor commercial/industrial workers or construction workers). Although specific redevelopment plans for either area have not been proposed, these COPCs were identified as COCs for potential indoor inhalation exposures assuming future commercial/industrial use. Shallow soil vapor remediation goals were established for these three COCs to mitigate potential exposures to a future indoor commercial/industrial worker (applicable to soil vapor within 15 feet bgs) using the noncancer-based RBSLs protective of a chemical-specific noncancer HQ of 1 (1500 µg/L, 37 µg/L, and 32 µg/L for TPH as Stoddard solvent, 1,2,4-TMB, and 1,3,5-TMB, respectively [Table 3]). These remediation goals were derived protective of a cumulative HI of 1 (500 µg/L, 12.3 µg/L, and 10.7 µg/L for TPH as Stoddard solvent, 1,2,4-TMB, and 1,3,5-TMB, respectively). These values were established as the final remediation goals for these VOCs under future commercial/industrial use as summarized in Table 22. TPH as Stoddard solvent, 1,2,4-TMB, and 1,3,5-TMB are at concentrations in shallow soil vapor that exceed remediation goals near the former Stoddard solvent USTs area, the former tube mill Stoddard solvent dip tanks and vault area, and the former tube mill and roll stretcher machine area (Figure 913).

1,2-DCA and TCE were identified as key COPCs for potential vapor intrusion risks from groundwater at a depth of 150 feet bgs for commercial/industrial workers (Table 12), but were not identified as COCs for this pathway. Cumulative cancer risks for the pathway were below

$10^{-5}$ , the target risk level proposed for commercial/industrial use of the Site. Furthermore, vapor intrusion risks evaluated using shallow soil vapor data are more significant, with chloroform, PCE, TCE, TPH as Stoddard solvent, 1,2,4-TMB, and 1,3,5-TMB identified as COCs in soil vapor for this pathway. This difference is likely due to the presence of a fine-grained unit at approximately 50 feet bgs and potential source areas related to these COCs. An applicable remedy will be proposed to mitigate these potential vapor intrusion risks.

### **5.2.2 Direct Contact Exposure**

Site-specific remediation goals were established for PCBs and arsenic in shallow soil (0 to 15 feet bgs) to mitigate potential direct contact exposures to future workers. Specifically, remediation goals were developed to mitigate potential exposures to construction workers involved with future construction at the Site as well as to workers under future commercial/industrial use of the Site. Sections 5.2.2.1 and 5.2.2.2 describe the site-specific remediation goals derived for PCBs and arsenic, respectively. Section 5.2.2.3 explains why direct contact exposure-based remediation goals were not derived for chromium, cobalt, and TPH compounds.

#### **5.2.2.1 Site-Specific Remediation Goals for PCBs**

As presented in Tables 4 through 10, the estimated cancer risks for outdoor commercial/industrial worker exposure to the Aroclor mixtures detected in soil (Aroclor-1016, -1232, -1248, -1254, and -1260) are greater than the predicted risks for construction worker exposure to these compounds. Therefore, soil remediation to mitigate potential outdoor commercial/industrial worker exposure to these Aroclor mixtures would also mitigate potential construction worker exposure. Similarly, remediation of concrete proposed for re-use at the site as potential fill materials would mitigate both potential outdoor commercial/industrial worker exposure and construction worker exposure to carcinogenic PCBs in concrete. However, the potential exposure to future outdoor commercial/industrial workers would only occur if PCB-impacted soil or concrete is left exposed at the land surface at the Site. To mitigate potential exposures to PCB-impacted soil, two risk-based remediation goals for PCBs (as total Aroclors) were developed and initially presented in the PCBNP (AMEC, 2009); one for soil that may be left exposed at the surface (protective of both potential outdoor commercial/industrial worker exposure and construction worker exposure), and another for subsurface soil that only construction workers may come into contact with during excavation, grading, etc. (and would remain in the subsurface following such activities). These two remediation goals as initially proposed are described briefly below.

- A PCB remediation goal of 5.3 mg/kg (total Aroclors) was proposed for soil that may be left exposed at the surface (0 to 5 feet bgs). This goal is based on the cancer-based RBSL of 0.53 mg/kg for outdoor commercial/industrial worker exposure to PCBs in soil, adjusted to a  $10^{-5}$  risk level (Table 1).



- A PCB remediation goal of 35 mg/kg (total Aroclors) was proposed for subsurface soil (at 5 to 15 feet bgs) that only construction workers may come into contact with during excavation, grading, etc. and that would remain below pavement (or 5 feet below crushed concrete containing less than 5.3 mg/kg). This goal is based on the cancer-based RBSL of 3.5 mg/kg for construction worker exposure to PCBs in soil, adjusted to a  $10^{-5}$  risk level (Table 1).

These remediation goals are consistent with the remediation goals established for commercial/industrial worker exposures to COCs in soil vapor that are also protective of a cumulative target cancer risk level of  $10^{-5}$ . The noncancer-based RBSL developed for construction worker exposure to Aroclor-1254, 2.0 mg/kg (Table 1), was proposed as an additional soil remediation goal specifically for this Aroclor mixture that is protective of a chemical-specific, noncancer HQ of 1 (AMEC, 2009). Given the relative magnitude of the construction worker noncancer-based RBSL to the outdoor commercial/industrial worker noncancer-based RBSL (2.0 mg/kg versus 7.5 mg/kg, respectively) (Table 1), mitigation of noncancer hazards to construction workers from exposure to Aroclor-1254 would also mitigate noncancer hazards to outdoor commercial/industrial workers. Finally, for concrete that may be demolished on site, crushed, and reused as fill in soil and foundation removal areas, the total PCB remediation goal of 5.3 mg/kg for surface soil was proposed as the remediation goal for potential exposure to PCBs in concrete (AMEC, 2009). Applying this remediation goal would also ensure that the waste criteria for concrete containing PCBs would also be met [i.e., less than 50 mg/kg, as defined in 40 CFR Section 761.61(a)(4)(i)(A)].

As part of the U.S. EPA's conditional approval (U.S. EPA, 2010a) of the PCBNP, the U.S. EPA deferred approval of the proposed remediation goals until Pechiney could demonstrate that dioxin-like PCB congeners, if present in on-site concrete and/or soil, do not increase the cumulative cancer risk for the Site above  $1 \times 10^{-5}$ . If this risk level were exceeded, it was required that Pechiney propose cleanup levels for PCBs in concrete and soil that are adequately protective and do not pose a risk of injury to health or the environment. Based on this requirement, additional sampling (outlined in Section 2.2 of the SAP [AMEC, 2010]) was conducted in September and October, 2010, and the sampling results were evaluated for potential human health concerns. Nine concrete samples and 17 soil samples were collected and "split" for analysis by U.S. EPA Method 8082 for PCBs as Aroclor mixtures and analysis by U.S. EPA Method 1668B for individual "dioxin-like" PCB congeners.<sup>3</sup> The samples selected for both analyses were collected from areas where total Aroclors were reported from previous rounds of sampling at high, medium, and low concentrations with respect to the proposed 5.3 mg/kg risk-based remediation goal, with the majority of the samples intentionally collected from locations where total Aroclor concentrations were just below the remediation goal (within

one order of magnitude). Specific information regarding the targeted sample locations and sampling procedures is provided in the SAP (AMEC, 2010). The intent of the targeted sampling was to provide coverage across a range of concentrations so that potential correlations between PCBs as Aroclors and the dioxin-like PCB congeners could be evaluated.

Two separate evaluations were then conducted with the pairs of dioxin-like PCB congener and Aroclor mixture data from the 2010 concrete and soil samples to determine if dioxin-like PCB congeners present a more significant human health risk than PCBs as Aroclors, and if the proposed risk-based remediation goals for the Site based on total Aroclor concentrations would be adequately protective for dioxin-like PCB congeners. These two evaluations are discussed below.

#### Regression Analyses of Dioxin TEQ versus Total Aroclors

Regression analyses were performed with the pairs of dioxin-like PCB congener and Aroclor mixture data to evaluate the potential significance of the relationship between these measurements and determine whether the proposed risk-based remediation goals are adequately protective of potential PCB exposures. Potential correlations were evaluated between the dioxin-like PCB congeners expressed as dioxin toxic equivalent (TEQ) and the Aroclor mixture data expressed as total Aroclor concentrations. Dioxin TEQ concentrations were calculated for each sample using the toxic equivalency factors (TEFs) developed by the World Health Organization (WHO) in 2005 (Van den Berg, M. et al., 2006). Where the concentration of an individual dioxin-like PCB congener was reported as not detected, one half of the detection limit was used as a surrogate to calculate the contribution to dioxin TEQ concentrations from that congener. Of the two commonly used approaches to calculating a dioxin TEQ,<sup>4</sup> using one half of the detection limit for non-detect results was considered appropriate for the 2010 concrete and soil data given that all 12 dioxin-like PCB congeners were detected at least once in both data sets, thus providing evidence that all 12 congeners were present at the Site. Dioxin TEQ concentrations for PCB congeners ranged from 2.81 to 14,250 picograms per gram (pg/g) in concrete and 0.14 to 573 pg/g in soil (TEQ concentrations are presented in the data tables in Appendix A). For consistency with the treatment of non-detect congeners in the estimation of dioxin TEQ, one half of the reporting limit for non-detect Aroclor mixtures was used in the calculation of total Aroclors, with results for Aroclor-1016, -1232, -1248, -1254, and -1260 factoring into the total Aroclor concentration

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<sup>3</sup> Concrete samples were split by first milling each sample to a powder/fine granular mixture, then homogenizing the sample, then dividing the sample into two aliquots. Soil samples were split by manually (mechanically) blending each sample and then dividing into two aliquots.

<sup>4</sup> The alternative approach to calculating dioxin TEQ is to assume that non-detect congeners are not present and thus contribute zero to dioxin TEQ concentrations.

calculations (i.e., the Aroclor mixtures that were detected at least once in the concrete and soil samples combined).

Details of the regression analyses are presented in Appendix E. Separate regression analyses were performed for the concrete samples, soil samples, and concrete and soil samples combined, with the relative strength of each regression evaluated. As presented in Appendix E, the "strongest" regression was the regression using the untransformed combined soil and concrete data. This regression identifies a concentration of total Aroclors at a risk-based remediation goal equivalent for dioxin TEQ (81 pg/g) that is less than the originally proposed risk-based remediation goal of 5.3 mg/kg for concrete and soil that may be left exposed at the surface (0 to 5 feet bgs). Specifically, the total Aroclor concentration corresponding to 81 pg/g dioxin TEQ on the regression line is approximately 3.5 mg/kg. As a result, a revised risk-based remediation goal for PCBs (as total Aroclors) of 3.5 mg/kg for concrete and soil that may be left exposed at the surface (0 to 5 feet bgs) would be adequately protective of PCBs as dioxin-like congeners. To determine if the originally proposed risk-based remediation goal for PCBs (as total Aroclors) for deeper soil (between 5 and 15 feet bgs) of 35 mg/kg would be adequately protective, the results of the regression for the combined soil and concrete data (untransformed) were also plotted against this remediation goal along with the equivalent risk-based remediation goal for dioxin-like PCB congeners, 530 pg/g TEQ.<sup>5</sup> As shown in Appendix E (Figure E-3), the regression using the combined soil and concrete data (untransformed) identifies a concentration of total Aroclors at a risk-based remediation goal equivalent for dioxin TEQ (530 pg/g) that is less than 35 mg/kg. As a result, a revised risk-based remediation goal for PCBs (as total Aroclors) of 23 mg/kg for deeper soil (between 5 and 15 feet bgs) would be adequately protective of PCBs as dioxin-like congeners.

#### Human Health Risk Calculations for Dioxin-like PCB Congeners and Aroclor Mixtures

Potential human health risks associated with the dioxin-like PCB congener and Aroclor mixture data from the 2010 concrete and soil samples were also comparatively estimated to further assess the need to revise the proposed risk-based remediation goals based on Aroclor mixtures. Hypothetical, representative exposure point concentrations (EPCs) were calculated for the 12 dioxin-like PCB congeners and five Aroclor mixtures detected in the 2010 concrete and soil characterization samples. For the dioxin-like PCB congeners, EPCs were calculated for the individual congeners as well as for dioxin TEQ. For this evaluation, EPCs were calculated for the concrete and soil data combined, assuming that exposure of future workers is potentially complete for both media (i.e., assuming concrete building slabs may be demolished on site, crushed, and intermixed with soil for reuse in removal areas). U.S. EPA's

<sup>5</sup> Based on the carcinogenic RBSL for dioxin-like PCB congeners for construction workers (53 pg/g TEQ), adjusted to a target cancer risk of  $10^{-5}$ .

ProUCL product (U.S. EPA, 2010b) was used to determine upper confidence limit of the mean EPCs for dioxin TEQ, each dioxin-like PCB congener, and each Aroclor mixture. The resulting ProUCL output is provided in Appendix F.

Potential human health risks from exposure to PCBs were then estimated by quantitatively comparing the resulting EPCs to the RBSLs presented in Section 4.2.2 and Table 1. To streamline the evaluation, EPCs were only compared to the lowest of available RBSLs, the cancer-based RBSLs for outdoor commercial/industrial workers. Comparing the EPCs to these RBSLs would provide a conservative estimate of potential human health risks from exposure to PCBs as dioxin-like congeners versus PCBs as Aroclors. Predicted lifetime excess cancer risks were calculated for outdoor commercial/industrial workers by dividing each EPC by the appropriate cancer-based RBSL, and then multiplying these risk ratios by the target risk level used in the development of the RBSLs (i.e., one-in-one million or  $1 \times 10^{-6}$ ). Risks from exposure to dioxin-like PCB congeners were then comparatively evaluated to risks from exposure to the Aroclor mixtures.

The results of the analysis are presented in Table 23. As presented, the predicted lifetime excess cancer risk for outdoor commercial/industrial worker exposure to dioxin-like PCB congeners is  $2 \times 10^{-4}$  based on EPCs for each of the individual congeners, but  $8 \times 10^{-4}$  based on dioxin TEQ. The difference in these risk estimates can be attributed to the influence of elevated detection limits in the sample-specific calculations of dioxin TEQ. By comparison, the predicted lifetime excess cancer risk for outdoor commercial/industrial worker exposure to Aroclor mixtures is  $5 \times 10^{-4}$ . As a result, it would appear that, on average, the dioxin-like PCB congeners do not pose a more significant human health risk than PCBs evaluated as Aroclor mixtures, but on a sample-by-sample basis (as dioxin TEQ), the congeners present a slightly more significant human health risk than PCBs evaluated as Aroclor mixtures. These results are consistent with the results of the regression analyses. Given that the potential human health risks from dioxin-like PCB congeners as dioxin TEQ are slightly more significant than the potential human health risks from total Aroclors, a slight reduction of the risk-based remediation goals for PCBs as total Aroclors (as illustrated by the regression analyses) would be necessary to be adequately protective of PCBs as dioxin-like congeners.

#### Summary of Revised PCB Remediation Goals

Based on the above evaluations, the revised PCB (as total Aroclor) remediation goals proposed for the Site are summarized below. These goals were conditionally approved by U.S. EPA on July 1, 2011.

##### 1. Proposed Remediation Goals for PCBs in Concrete

- **Total Aroclors – 3.5 mg/kg.** Based on the regression analysis for dioxin-like PCB congeners versus total Aroclors in combined soil and concrete, the total Aroclor concentration that would result in a maximum dioxin TEQ concentration of 81 pg/g.

## 2. Proposed Remediation Goals for PCBs in Shallow Soil (0 to 15 feet bgs)

- **Aroclor-1254 – 2.0 mg/kg.** For soil between 0 and 15 feet bgs. Based on the noncancer RBSL for construction workers and a target noncancer HI of 1.
- **Total Aroclors – 3.5 mg/kg.** For soil that may be left exposed at the surface (0 to 5 feet bgs). Based on the regression analysis for dioxin-like PCB congeners versus total Aroclors in combined soil and concrete, the total Aroclor concentration that would result in a maximum dioxin TEQ concentration of 81 pg/g.
- **Total Aroclors – 23 mg/kg.** For subsurface soil (5 to 15 feet bgs) that only construction workers may come into contact with during excavation, grading, etc. (and that would remain at 5 to 15 feet bgs). Based on the regression analysis for dioxin-like PCB congeners versus total Aroclors in combined soil and concrete, the total Aroclor concentration that would result in a maximum dioxin TEQ concentration of 530 pg/g.

All site-specific remediation goals for PCBs are also summarized in Table 24, with explanations provided for how each value was established.

### 5.2.2.2 *Site-Specific Remediation Goal for Arsenic*

For arsenic, a remediation goal corresponding to the site-specific background concentration of 10 mg/kg was used to mitigate potential outdoor commercial/industrial worker and construction worker exposures to this COC (Table 24). Although the site-specific background concentration is above the cancer-based RBSLs for outdoor commercial/industrial worker or construction worker exposure, remediation of soil to levels below background is not typically required by U.S. EPA (U.S. EPA, 2004) or DTSC (DTSC, 1997).

### 5.2.2.3 *Other Key Chemicals*

Chromium was identified as a key chemical for hypothetical future construction worker exposure in the Phase II area (Table 5), but was not identified as a COC. Chromium contributed a cancer risk level of  $3.8 \times 10^{-6}$  for the construction worker scenario, but no other carcinogenic COPCs (i.e., PCBs) were detected in the vicinity of the maximum detected concentration used in the screening (from boring H-1, 5 feet bgs; Appendix A). Provided the PCB-impacted areas of the Phase II area are remediated, the residual risk would be below the

proposed cumulative target cancer risk level of  $10^{-5}$ . All remaining detected concentrations of chromium at the Site were below site-specific background (25 mg/kg).

Cobalt was identified as a key chemical for hypothetical future construction worker exposure in the Phase IV area (Table 8), contributing a cancer risk level of  $1.4 \times 10^{-6}$  and a noncancer hazard quotient of 2, but was not identified as a COC. The maximum detected concentration used in the screening, 16 mg/kg (from boring SWC-3B at 15 feet bgs; Appendix A) is just above site-specific background (14.1 mg/kg), with all remaining detected concentrations below the background level. On average, the cobalt concentrations at the Site are consistent with background.

TPH as c6-c10 hydrocarbons was identified as a key chemical for hypothetical future construction worker exposure in the Phase IIIb and Phase IV areas. Under worst-case assumptions (using worst-case RBSLs), TPH as c10-c20 hydrocarbons would also be identified as a key chemical for hypothetical future construction worker exposure in the Phase IIIa area (Table 6); TPH as c10-c28 hydrocarbons would also be identified as a key chemical for hypothetical future construction worker exposure in the Phase IIIb area (Table 7); and TPH as c10-c20 hydrocarbons and TPH as c10-c28 hydrocarbons would also be identified as key chemicals for hypothetical future construction worker exposure in the Phase IV area (Table 8). However, risk-based remediation goals were not developed for these TPH compounds from their respective noncancer-based RBSLs. The site-specific soil screening levels for the protection of groundwater for these compounds, 500 mg/kg (for TPH as c6-c10 hydrocarbons) and 1000 mg/kg (for TPH as c10-c20 hydrocarbons and TPH as c10-c28 hydrocarbons, respectively), are lower than their respective noncancer-based RBSLs for construction worker exposure, 6900 mg/kg and 33,000 mg/kg (or 2900 mg/kg and 6600 mg/kg, the worst-case RBSLs; Table 1). Thus, any remediation proposed for these compounds to meet RAOs for the protection of groundwater, as described in Section 5.2.3 below, would also meet the RAOs for the protection of future construction worker exposures.

#### **5.2.2.4 Areas where Arsenic and/or PCBs in Soil Exceed Remediation Goals**

The specific areas where arsenic and/or PCBs in soil are at concentrations that exceed the remediation goals established for the Site in the upper 15 feet of the vadose zone are as follows (Figure 139).

- Phase I Area – PCBs in soil and gravel fill adjacent to a former transformer located outside of Building 106 (along the east side of the building), and at isolated sub-slab sample locations between former Buildings 106 and 108.
- Phase II Area – PCBs in soil near the location of the saw and near the former buried vertical pit and near storm water outfall #7.

- Phase IIIa Area – Arsenic and PCBs in soil near the location of the cooling tower hot well, arsenic and PCBs in soil near storm water outfall #6, and PCBs (Aroclor-1254) in soil near the north and west sides of the former waste disposal pit.
- Phase IV Area – Arsenic and PCBs in soil near the former scalper/planer machine area.
- Phase VI Area – Arsenic in surface soil near the buried rail line.

### 5.2.3 Potential Beneficial Use of Groundwater

Groundwater in the first-water-bearing unit is not used for domestic water supply, but because the RWQCB has designated groundwater in the site vicinity for beneficial use, State and Federal MCLs were used to evaluate COPCs in groundwater. Five VOCs, including benzene, chloroform, 1,2-DCA, dichloromethane (i.e., methylene chloride), and TCE, were detected at concentrations above their respective MCLs. The specific areas where these VOCs are at concentrations above MCLs are as follows:

- Phase I Area – Benzene, 1,2-DCA, and TCE in groundwater samples collected from soil borings (using a hydropunch method) in the northwest portion of the site, within the footprint of Building 106.
- Phase IIIa Area – Chloroform, 1,2-DCA, and TCE in groundwater monitoring well samples collected from former well AOW-7.
- Phase IIIb Area – Chloroform, 1,2-DCA, and/or TCE in groundwater monitoring well samples collected west of Building 112A in the vicinity of the Stoddard solvent USTs at monitoring well AOW-8 and former monitoring well AOW-3.
- Phase IV Area – 1,2-DCA in groundwater monitoring well samples collected from well AOW-9.
- Phase VI Area – Dichloromethane (i.e., methylene chloride) and/or TCE in groundwater monitoring well samples collected from former well AOW-1.

These VOCs were subsequently identified as COCs, but site-specific remediation goals were not established. The concentrations of these compounds in groundwater beneath the northern portion of the Site will likely decrease over time by mitigating VOC-impacted soil in the Phase I area and implementing a monitored natural attenuation (MNA) program for these COCs in groundwater. The MNA approach is proposed for the Site for the following reasons:

- presence of low concentrations of chlorinated VOCs, with the concentration of TCE ranging between 3 and 420 µg/L in groundwater samples collected beneath the Site.

- depth at which groundwater was observed (about 150 feet below grade) limits potential exposure to TCE and other VOCs by inhalation through potential vapor intrusion or dermal contact with groundwater;
- observed reduction (attenuation) in chlorinated VOC concentrations in groundwater samples collected in the southern portion of the site since 1991 (wells AOW-3, AOW-7, AOW-8 and AOW-9);
- remediation proposed for an on-Site source of chlorinated VOCs in the northwestern portion of the Site (source removal);
- the presence of other source(s) of TCE in groundwater in the Site vicinity (regional impacts); and
- issuance of a land use covenant to restrict the use of on-Site groundwater within the first water-bearing unit.

#### 5.2.4 Potential Impacts to Groundwater

Several VOCs in soil, specifically TCE, PCE, 1,2-DCA, and BTEX, were identified as exceeding site-specific soil screening levels for the protection of groundwater as described in Section 4.3.1. All of these COPCs were subsequently identified as COCs, and the site-specific soil screening levels for these compounds were established as remediation goals to mitigate a potential future risk to groundwater. A summary of the remediation goals is provided in Table 25. The RWQCB screening levels for groundwater protection for TPH in soil were also established as remediation goals for the various TPH fractions and constituents identified as above these criteria in Section 4.3. These remediation goals are summarized in Table 24. The specific areas and depths where the identified VOCs and TPH are at concentrations that exceed the remediation goals are as follows (Figure 912):

- Phase I area – TCE and PCE detected at depths between 21.5 and 136 feet bgs in soil in northern portion of Buildings 106, 108, and 112. Benzene and toluene detected at depths between 50.5 and 140 feet bgs in soil in the southern portion of Building 106. 1,2-DCA detected at depths between 50.5 and 80.5 feet bgs in soil in the southern portion of Building 106.
- Phase IIIa area – TPH as c10-c20 hydrocarbons and c21-c28 hydrocarbons detected at 10 feet bgs at the north end of the former waste disposal pit.
- Phase IIIb area – Benzene, Stoddard solvent compounds as TPH (specific carbon ranges of c5-c10, c6-c10, c7-c12, and other TPH compounds [c10-c20, c10-c28, and c21-c28]) detected at depths between 10 and 45 feet bgs in soil in the area of the former Stoddard solvent USTs.
- Phase IV Area – Stoddard solvent compounds as TPH (specific carbon ranges of c6-c10), BTEX compounds, and TPH (specific carbon ranges of c10-c20 and c10-c28) detected in the locations of the former tube mill and roll stretcher machine, the



scalper/planer machine, and former tube mill Stoddard solvent dip tanks and vault areas in soil at depths between 1 and 58.5 feet bgs.

### 5.2.5 Summary of Site-specific Remediation Goals

As described in Sections 5.2.1 through 5.2.3 above, various site-specific remediation goals were established for COCs in soil vapor, soil, and concrete at the Site under various future land use scenarios (e.g. commercial/industrial land use). These site-specific remediation goals are also summarized in Tables 22, 24, and 25, with explanations provided for how each value was established. In summary, the site-specific remediation goals established for such scenarios are as follows:

Remediation Goals Established for COCs in Shallow Soil Vapor – for potential future commercial/industrial indoor air exposure (Table 22):

#### 1. VOCs in Shallow Soil Vapor (at 5 and 15 feet bgs)

- Chloroform – **6.7 µg/L**
- PCE – **7.3 µg/L**
- TCE – **21 µg/L**
- TPH as Stoddard solvent – **500 µg/L**
- 1,2,4-TMB – **12.3 µg/L**
- 1,3,5-TMB – **10.7 µg/L**

Remediation Goals Established for COCs in Soil and Concrete – for future commercial/industrial use scenarios (Table 24):

#### 2. PCBs in Shallow Soil (surface to 15 feet bgs)

- Aroclor-1254 – **2.0 mg/kg**
- Total Aroclors – **3.5 mg/kg** for soil that may be left exposed at the surface (0 to 5 feet bgs)
- Total Aroclors - **23 mg/kg** for subsurface soil (5 to 15 feet bgs) that only construction workers may come into contact with during excavation, grading, etc. (and that would remain at 5 to 15 feet bgs)

#### 3. PCBs in Concrete

- Total Aroclors – **3.5 mg/kg**

#### 4. Metals in Shallow Soil (0 to 15 feet bgs)

- Arsenic – **10 mg/kg**

5. TPH in Shallow and Deeper Soil (surface to groundwater, at approximately 150 feet bgs)

- c5-c10 hydrocarbons, c6-c10 hydrocarbons, c7-c12 hydrocarbons, and TPH as Stoddard solvent – **500 mg/kg** (gasoline range hydrocarbons)
- c10-c20 hydrocarbons and c10-c28 hydrocarbons – **1000 mg/kg** (diesel range hydrocarbons)
- c21-c28 hydrocarbons – **10,000 mg/kg** (residual fuel range hydrocarbons)

VOCs in Shallow and Deeper Soil (surface to groundwater, at approximately 150 feet bgs) – depth-specific remediation goals for TCE, PCE, BTEX, and 1,2-DCA are presented in Table 25.

Remediation goals were not established for the COCs identified in groundwater. Monitored natural attenuation of VOCs in groundwater in combination with on-site vadose zone source remediation as a is proposed as the remedial approach is proposed to be used for groundwater at the Site.

Boring or sample locations with matrix sample concentrations above the site-specific remediation goals are shown on Figure 912.

### 5.3 AREAS WITH COC-IMPACTED SOIL ABOVE THE REMEDIATION GOALS

Based on previous investigation data and screening risk assessment findings, the following areas within each Phase area were identified with COC-impacted soils having concentrations greater than the applicable site-specific remediation goals described in Section 5.2. These areas will need to be addressed as part of Site closure. The approximate dimensions and in-place soil volumes for each of the areas summarized below are shown on Figure 1440.

#### Phase I Area:

- Area 1: Northeast portion of former Building 112 where soil is impacted with TCE at concentrations above the site-specific remediation goal for the future protection of groundwater.
- Area 2: Southern portion of former Building 106 where soil is impacted with benzene, 1,2-DCA and TCE at concentrations above the site-specific remediation goals for the future protection of groundwater.
- Area 3: Northwest corner of the Site (former Buildings 106 and 108) where soil, soil vapor, and groundwater are impacted with TCE (and other VOCs). TCE and PCE concentrations in soil are above site-specific remediation goals for the future

protection of groundwater. Chloroform, TCE, and PCE are above site-specific remediation goals for potential commercial/industrial indoor air exposure.

- Area 13: West of Building 106 (near former substation #8) where soil and gravel are impacted with PCBs at concentrations above the site-specific remediation goal for the protection of future commercial/industrial workers (i.e., soil from 0 to 5 feet).
- Areas 16a, 16b, and 16c: Northwest portion of the Site (between former Buildings 106 and 108) where sub-slab soil is impacted with PCBs at concentrations above the site-specific remediation goal for the protection of commercial/industrial workers (i.e., soil from 0 to 5 feet).

#### Phase II Area:

- Areas 4a and 4b: West-central portion of former Building 104 (near the former vertical pit) where soil is impacted with PCBs at concentrations above the site-specific remediation goals for the protection of future of commercial/industrial workers (i.e., soil from 0 to 5 feet) and future construction workers (i.e., soil from 5 to 15 feet).
- Areas 5a, 5b and 5c: Southern portion of former Building 104 (near the saw location) where soil is impacted with PCBs at concentrations above the site-specific remediation goal for the protection of future commercial/industrial workers (i.e., soil from 0 to 5 feet). Areas 5a and 5b are located in areas with PCB-impacted concrete.
- Area 15: Near former storm water outfall #7 (west of former Buildings 106 and 104) where soil remains impacted with PCBs at concentrations above the site-specific remediation for the protection of future of commercial/industrial workers (i.e., soil from 0 to 5 feet) and future construction workers (i.e., soil from 5 to 15 feet).

#### Phase IIIa/b Areas:

- Areas 6a and 6b: North side of cooling tower hot well area where soil is impacted with arsenic at a concentration above the site-specific background level for this metal (i.e., the remediation goal) and where soil remains in place at 3 feet and is impacted with PCBs at a concentration above the site-specific remediation goal for the protection of future commercial/industrial workers (i.e., soil from 0 to 5 feet).
- Area 7: Near storm water outfall #6 area where soil is impacted with arsenic and at the north end of the former inert waste disposal pit where soil is impacted with PCBs (Aroclor-1254). The concentration of arsenic is above the site-specific background level for this metal (i.e., the remediation goal). The concentration of Aroclor-1254 is above the site-specific remediation goal for the protection of future commercial/industrial workers and future construction workers.
- Area 14: Along the west side of the former storm water outfall #6 (at the fence line) where soil remains in place at 2 feet and is impacted with PCBs at a concentration above the site-specific remediation goal for the protection of future commercial/industrial workers (i.e., soil from 0 to 5 feet).

- Area 8: Former Stoddard solvent USTs and still area where soil is impacted with Stoddard solvent compounds and benzene at concentrations above the site-specific remediation goals for the protection of groundwater, and TPH (c6-c10 hydrocarbons) at concentrations above the site-specific remediation goal for the protection of groundwater and future construction workers. The area is also impacted with Stoddard solvent and trimethylbenzenes in soil vapor above site-specific remediation goals for potential commercial/industrial indoor air exposure.

#### Phase IV Area:

- Areas 9a and 9b: Area east and west of the former scalper and planer machines where soil is impacted with arsenic at a concentration above the site-specific background level for this metal (i.e., the remediation goal), and where soil is impacted with TPH above the site-specific remediation goals for the protection of groundwater (Area 9b).
- Area 9c: The location of the scalper/planer machine area where soil is impacted with Stoddard solvent compounds and benzene at concentrations above the site-specific remediation goals for the protection of groundwater (Note: monitoring well AOW-9 located near this area will be protected during proposed remediation activities), and TPH (c6-c10 hydrocarbons and c10-c20 hydrocarbons) at concentrations above the site-specific remediation goal for the protection of groundwater and future construction workers. The area is also impacted with Stoddard solvent and trimethylbenzenes in soil vapor above site-specific remediation goals for potential commercial/industrial indoor air exposure.
- Area 9d: Area north of the scalper and planer machines where soil is impacted with PCBs (Aroclor-1254) at a concentration above the site-specific remediation goal for the protection of future commercial/industrial workers and future construction workers.
- Area 10: Former tube mill Stoddard solvent dip tanks and vault area where soil is impacted with TPH, Stoddard solvent compounds, and BTEX at concentrations above site-specific remediation goals for the protection of groundwater. The area is also impacted with Stoddard solvent and trimethylbenzenes in soil vapor above site-specific remediation goals for potential commercial/industrial indoor air exposure.
- Area 11: Former tube mill and roll stretcher machine area where soil is impacted with TPH, Stoddard solvent compounds, benzene, ethylbenzene, and xylenes at concentrations above the site-specific remediation goals for the protection of groundwater. The area is also impacted with Stoddard solvent and trimethylbenzenes in soil vapor above site-specific remediation goals for potential commercial/industrial indoor air exposure.

#### Phase VI Area:

- Area 12: Southern portion of Parcel 7 (near the southern buried railroad tracks) where soil is impacted with arsenic at a concentration above the site-specific background level for this metal (i.e., the remediation goal).

The remediation scenarios include addressing surface and shallow COC-impacted soils and deeper VOC-, PCB-, TPH-, and Stoddard solvent-impacted soils and will be evaluated further in this FS. A detailed evaluation of soil management of shallow COC-impacted areas that will be encountered during below-grade demolition along with excavation and off-site soil disposal is provided in the RAP (AMEC, 2011).

#### **5.4 AREAS WITH PCB-IMPACTED CONCRETE**

PCB-impacted concrete areas exceeding the site-specific remediation goal of 3.5 mg/kg for total Aroclors were identified and are shown on Figure 7. Areas of PCB-impacted concrete were found in Buildings 104, 106, 108, and 110, with a small area of impact in Building 112.

#### **5.5 GENERAL RESPONSE ACTIONS**

GRAs are general categories of action that, when implemented, will meet the RAOs for the Site (U.S. EPA, 1988). Combinations of GRAs may be used to meet the RAOs if needed. Five GRAs that may be applicable to mitigate soil and concrete impacts in this case are summarized below.

- No Action [NCP 40 CFR 300.430(e)(6)]: the CERCLA FS process requires a “no action” alternative to provide a basis of comparison to other remedial actions. All ongoing activities would cease under this response. Natural attenuation, degradation, dispersion, adsorption, dilution, and volatilization are the only processes that would take place and will occur regardless of intervention.
- Institutional controls: institutional controls are typically implemented as a site-management alternative using tools such as deed covenants, water-use restrictions, land-use restrictions, and/or the monitoring of a site condition to prevent unintended use of the site or groundwater. Institutional controls are appropriate for site management when risk to human health or the environment as a result of existing environmental conditions is low or easily managed. Institutional controls may also be used as a component of a more extensive or comprehensive remediation program when full restoration of site conditions is not needed for the intended land and groundwater use.
- Containment: containment can be used to control the movement or mobilization of COCs. A containment technology under consideration is capping, which would provide dermal contact barriers or physical barriers between receptors and soil or concrete impacted with COCs and could also reduce or limit infiltration and leaching of COCs to groundwater. Specific capping remedies may include a physical barrier placed at depth over deeper soil, placement of clean crushed concrete as an interim cap over localized areas of crushed concrete fill materials impacted with COCs, or a sub-slab vapor-barrier component, depending upon COC type and future site use.
- Ex situ treatment: ex situ treatment involves excavating and removing soil or other materials impacted with COCs. Impacted soil can be treated on-site by

technologies such as thermal desorption, aeration, landfarming, or bioremediation and reused as backfill after treatment is complete. Impacted soil can also either be treated and/or disposed off site at a landfill. An additional COC-impacted media at the Site includes concrete slabs known to be impacted with PCBs. Remedial options for PCB-impacted concrete include ex-situ treatment technology evaluations as described in Sections 6.0 and 7.0.

- In situ treatment: in situ treatments immobilize, destroy, break down, or remove COCs from the impacted soil. In situ treatment involves the application of biological, chemical, or physical processes that reduce toxicity, mobility, and/or mass of COCs. Possible in situ treatment technologies include: bioremediation, bioventing, SVE, in situ thermal desorption, and solidification/stabilization.

## 5.6 PRELIMINARY ARARs EVALUATION

The following section presents an overview of the applicable or relevant and appropriate requirements (ARARs) process and identifies ARARs affecting the RAOs. ARARs are site-specific requirements and involve a two-part analysis: first, an evaluation of whether a given requirement is applicable; then if it is not applicable, whether it is nevertheless relevant and appropriate. As further discussed below a component of the remedy selection process is whether it meets ARARs.

Applicable requirements are those remediation standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal, state, and local law that specifically address the situation at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence when objectively compared to the conditions at the site. If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate (U.S. EPA, 1988).

Relevant and appropriate requirements are those remediation standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law, that while not applicable, address problems or situations sufficiently similar to the circumstances of the proposed response action and are well suited to the conditions of the site (U.S. EPA, 1988).

A requirement must be substantive in order to constitute an ARAR for activities conducted on-site. Procedural or administrative requirements such as permits and reporting requirements are not ARARs. In addition to ARARs, the NCP suggests that lead and support agencies may identify other agency advisories, criteria, or guidance “to-be-considered” (TBC) for a particular release. The TBC category consists of advisories, criteria, or guidance that were developed by U.S. EPA, other federal agencies, or states that may be useful in developing CERCLA remedies [NCP 40 CFR 300.400(g)(3)]. These provisions are, however, only useful in

developing remedial action alternatives and are not promulgated federal or state ARARs (U.S. EPA, 1988). Requirements of ARARs and TBCs are generally divided into three categories: chemical-specific, location-specific, and action-specific.

## **6.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES**

This section describes the screening criteria and evaluation of potential remedial technologies to mitigate the COCs identified in this FS. This section also presents the results of the remedial action technology screening process for soil, soil vapor, and concrete at the Site.

### **6.1 SCREENING CRITERIA**

As specified in the NCP 40 CFR 300.430(e)(7)(i),(ii),(iii), remedial technologies are initially screened according to the criteria of effectiveness, implementability, and cost. The objective of this section is to develop a range of potential remedial technologies that can be further evaluated as required by the NCP guidelines. A detailed evaluation is performed on these remedial action alternatives in Section 7.1, and the proposed, preferred remedial alternative is recommended for implementation at the Site in Section 8.0. A proposed public participation program is included in Section 9.0. A RAP is provided in a separate document (AMEC, 2011).

#### **6.1.1 Effectiveness**

Effectiveness is evaluated based on how well a technology meets the RAOs, protects human health and the environment in the short and long term; attains federal and state ARARs; significantly and permanently reduces the toxicity, mobility, or volume of hazardous constituents; and is technically feasible and reliable.

#### **6.1.2 Implementability**

Implementability is evaluated based on the technical feasibility and availability of a technology, the technical and institutional ability to monitor and maintain a technology, and the administrative feasibility of implementing the technology. Implementability criteria also consider useable Site space or area and schedule constraints as related to implementation of certain technologies, either prior to or in conjunction with proposed future Site use.

#### **6.1.3 Cost**

The cost is the total cost of the remedy and is evaluated as the net present value. At the screening stage, a high level of accuracy in estimating costs is not required. CERCLA guidance indicates that an accuracy of -30 percent to +50 percent is acceptable.

### **6.2 EVALUATION PROCESS**

The technology screening evaluation process begins by developing a list of applicable technologies for mitigating COC impacts at the Site. Many of the remedial technologies

initially identified for consideration at VOC-, metals-, Stoddard solvent-, and PCB-impacted areas were presumptive remedies. "Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and U.S. EPA's scientific and engineering evaluation of actual performance data on technology implementation" (U.S. EPA, 1993). The objective of using presumptive remedies is to simplify or speed up the selection of a remedial action by eliminating the initial step of identifying and screening a broad variety of alternatives.

The presumptive remedy approach involves selecting remedies that have already been proven to be both feasible and cost-effective for specific site types and/or COCs. Presumptive remedies help promote consistency in remedy selection, improve the predictability of the remedy selection process, and are presumed to be NCP compliant (New York State, 2007).

After identifying those technologies with the greatest potential to meet the site-specific remediation goals described in Section 5.1, each of these remedial technologies was evaluated based on the screening criteria described in Section 6.1. The evaluation process consisted of the following steps.

1. Evaluate the effectiveness of each technology. If a technology is considered effective, retain it for an evaluation of implementability; otherwise eliminate the technology from further consideration.
2. Evaluate the implementability of the remaining technologies. If a technology is considered implementable, retain it for an evaluation of cost-effectiveness; otherwise eliminate the technology from further consideration.
3. Evaluate the cost-effectiveness of the remaining technologies. If a technology is considered cost-effective, retain it for possible incorporation in a remedial alternative; otherwise eliminate the technology from further consideration.

The results of the remedial technologies screening for soil, soil vapor, and concrete in Sections 6.3 and 6.4 are summarized in Tables 26 and 27, respectively. Only those technologies that met all three screening criteria are advanced to the detailed evaluation of remedial action alternatives in Section 7.0.

### **6.3 SOIL TREATMENT TECHNOLOGY SCREENING**

The following sections provide a description of the remedial technologies that were initially screened to mitigate the surface and shallow COC-impacted soil and deeper VOC- and Stoddard solvent-impacted soil at the Site. As shown on Table 26, each technology is either retained or eliminated based on the COC and screening criteria established in Section 6.1 as required pursuant to NCP 40 CFR 300.430 (e)(7)(i)(ii)(iii).



### 6.3.1 No Action

A "No Action" alternative is included for evaluation pursuant to NCP 40 CFR 300.430(e)(6) and is retained for comparative purposes. With this alternative, no active remedial action would be implemented at the Site. This alternative would not meet RAOs for the Site, nor would it result in a reduction of mobility, toxicity, or volume of known wastes. The Site would remain in its present state, and there would be no cost associated with this alternative. Naturally occurring processes such as attenuation, degradation, dispersion, adsorption, dilution, and volatilization may result in decreases in COC concentrations depending on the subsurface soil conditions. Pursuant to NCP 40 CFR 300.430(e)(6), this alternative is retained for comparative purposes only.

### 6.3.2 Institutional Controls

All of the remedial action alternatives evaluated for the Site, except the No Action alternative, will include some form of institutional controls. These controls include a variety of measures designed to prevent current and future property owners and operators from taking actions that would expose workers or other potential receptors to unacceptable risk, interfere with the effectiveness of the final remedy, convert the Site to an end use that is not consistent with the level of remediation, and/or allow residual COCs to migrate off site.

Institutional controls include deed covenants, land use and groundwater use restrictions, and zoning controls that may be applicable for the surface/shallow COC-impacted soil and deeper PCB-impacted and VOC-impacted soil remediation scenarios described in this FS. Applying the remediation goal (23 mg/kg) for total Aroclors in soil, remaining shallow soil in the depth interval of 5 to 15 feet bgs may contain PCBs at total Aroclor concentrations less than 235 mg/kg and could be left behind in low-occupancy [as defined in 40 CFR Section 761.61(a)(4)(i)(B)(3)] areas with capping, signage, and deed covenants. Implementation of institutional controls requires agreement between all parties affected or requires agreement between landowner/responsible party and regulatory agency.

The use of institutional controls as a stand-alone alternative does not meet the RAOs for the Site. However, regardless of the remedial alternative selected and implemented, the Site is assumed to operate under some form of institutional controls that dictate a commercial/ industrial land use and that identify the uppermost groundwater as not for potable use. As this assumption would be included with each alternative, institutional controls will not be independently evaluated further or included in subsequent remedial alternative evaluations.

### 6.3.3 Containment

Engineered barriers, such as a surface cap, were considered as a GRA for the shallow COC-impacted soil and deeper PCB-, VOC- and Stoddard solvent-impacted soil. The design of

engineered capping barriers is site-specific and depends on the intended functions of the system and the intended future Site use. Barriers can range from a one-layer system of vegetated soil, aggregates or concrete, to a complex multi-layer system of soils, geosynthetics, and/or pavements. The materials used in the construction of barriers include low-permeability and high-permeability soils, low-permeability geosynthetic products, aggregate base, asphalt, concrete, or other surface cover materials.

Capping consists of constructing a cover or cap system that provides a physical barrier to minimize contact exposure to receptors from impacted soil or concrete and may reduce potential infiltration of surface run-off. Vapor barriers use a combination of low-permeability materials including synthetic liners to inhibit VOC-vapor intrusion into buildings or other structures. A vapor barrier can be a component of a capping remedy at redeveloped sites that may contain newly constructed buildings. Vapor barriers can include subslab venting which involves venting soil vapor beneath building foundation slabs as a means of protecting building occupants from vapor intrusion.

Capping and vapor barriers are not retained for further evaluation for shallow COC-impacted soil and deeper VOC- and Stoddard solvent-impacted soil. Capping with concrete as a physical barrier is retained for further evaluation for deeper PCB-impacted soil in localized areas. The existing concrete slabs at the Site could be considered as a cap or barrier to prevent dermal contact with underlying soils, reduce infiltration, and limit volatile emissions. However, the presence of the existing concrete slabs at or above-grade level at the Site prevents future construction in the subgrade. Therefore, the existing concrete slabs must be removed and the underlying soil impacts must be mitigated. While permanently leaving the existing slabs and pavements in-place could be considered containment, it also represents a form of No Action, does not result in the removal of underlying foundations and footings, and therefore does not meet the RAOs for the Site. Specific details regarding future Site use are undefined, and capping with vapor barriers, if necessary, would be a design component of the proposed future development. Structures such as vapor barriers are not considered or evaluated in this document.

#### **6.3.4 Ex Situ Treatment**

Removal of impacted soils is a widely proven GRA. Removal technologies for soil typically refer to excavation followed by on-site treatment, off-site treatment, or disposal. Examples of on-site treatment technologies include low temperature thermal desorption (recycling), stabilization, aeration, and on-site landfarming or bioremediation. Off-site treatment includes landfill disposal, which may also include treatment such as low temperature thermal desorption, or stabilization, prior to landfilling.

Excavation and removal of impacted soil with off-site landfill disposal is retained for further consideration for surface and shallow COC-impacted soil. No post-excavation on-site treatment technologies were retained due to soil management controls or other requirements that would be necessary to effectively perform on-site treatment. These additional components include run-on and run-off controls for storm water management, potential bottom liners under soil stockpiles, control of dust and odor emissions, perimeter air monitoring, potential South Coast Air Quality Management District (SCAQMD) permitting issues, and on-going operations and maintenance requirements. Construction costs associated with implementation of these additional controls will generally negate or off-set any potential cost savings that might typically be associated with on-site treatment technologies. Although off-site treatment and disposal of COC-impacted soil was retained for further evaluation, this would only be a viable option if the impacted soil is acceptable to a receiving facility. PCB- and metals-impacted soils could be landfilled, while VOC- and Stoddard solvent-impacted soils could either be landfilled or recycled via thermal desorption.

#### **6.3.5 In Situ Treatment**

In situ treatment technologies considered for further evaluation include bioremediation and thermal desorption for organic COC-impacted soils, stabilization for all COC-impacted soils, SVE for VOC-impacted soil, and SVE followed by bioventing for Stoddard solvent-impacted soils. Stoddard solvent is comprised of approximately 15 percent volatile compounds and approximately 85 percent less volatile straight-chain hydrocarbons. Of the in situ treatment technologies evaluated for COC-impacted soil, SVE was retained for further consideration for both shallow and deep VOC- and Stoddard solvent-impacted soils and bioventing was retained for Stoddard solvent-impacted soils. SVE and bioventing are considered presumptive remedies for VOC- and Stoddard solvent-impacted soils, respectively.

In situ thermal desorption was not retained because it is ineffective on metals-impacted soil or in shallow soil applications less than 6 feet bgs. Thermal desorption is also relatively more expensive when compared to SVE or bioventing technologies for treatment of VOC- or Stoddard solvent-impacted soils, respectively. SVE is effective for VOC-impacted soil present at the Site (including Site-derived VOCs in soil vapor adjacent to the northwest corner of the Site) and could be implemented under current Site conditions; if successful, SVE would meet the RAOs. SVE and bioventing performed in a two-step treatment process is effective for Stoddard solvent-impacted soil present at the Site. SVE would initially be performed to remove the volatile mass fraction estimated to comprise approximately 10 to 15 percent of the mass of the Stoddard solvent impacts. After initial SVE operations reach asymptotic levels, continued in situ remediation would consist of bioventing to degrade the remaining less volatile yet biodegradable fuel-related hydrocarbons present in the Stoddard solvent. SVE and

bioventing could be implemented under current Site conditions and, if successful, would also meet RAOs.

Stabilization is also a viable remedial technology for PCB- and metals-impacted soils and is also retained for further consideration. Stabilization is also effective on VOC- and Stoddard solvent-impacted soil although the process would generate fugitive odor emissions that would require collection and treatment. Stabilization has previously been performed at other remediation sites within the City of Vernon. Typically a bench-scale mix design is required to determine the most effective stabilization admixture and corresponding percentage of additive necessary to meet stabilization objectives. Previous case studies suggest PCBs are amenable to stabilization and solidification technologies with simple cement-based additives, although a bench-scale mix study would be required to evaluate site-specific feasibility and an appropriate mix design prior to any field implementation.

#### **6.4 PCB-IMPACTED CONCRETE TREATMENT TECHNOLOGY SCREENING**

The following sections provide a description of the remedial technologies considered to mitigate the PCB-impacted concrete. As shown on Table 27, each technology is either retained or eliminated based on the screening criteria established in Section 6.1.

##### **6.4.1 No Action**

A "No Action" alternative is included for evaluation pursuant to NCP 40 CFR 300.430(e)(6) guidance and is retained for comparative purposes. With this alternative, no active remedial action would be implemented at the Site. This alternative would not meet RAOs for the Site, nor would it provide a reduction of mobility, toxicity, or volume of known wastes. The Site would remain in its present state, and there would be no cost associated with this alternative. Pursuant to NCP 40 CFR 300.130 (e)(6), this alternative is retained for comparative purposes only.

##### **6.4.2 Institutional Controls**

All of the remedial action alternatives evaluated for the Site, except the No Action alternative, will include some form of institutional controls. These controls include a variety of measures designed to prevent current and future property owners and operators from taking actions that would expose workers or other potential receptors to unacceptable risk, interfere with the effectiveness of the final remedy, convert the Site to an end use that is not consistent with the level of remediation, and/or allow residual impacts to move off site.

Institutional controls can include deed covenants, land use and groundwater use restrictions, and zoning controls that may be applicable for the PCB-impacted concrete described in this FS. The implementation of institutional controls requires agreement between landowner/

responsible party and regulatory agency. Federal TSCA regulations (CFR 761.61) require specific institutional controls regarding surface capping, signage, and low- versus high-occupancy Site use, depending on the concentrations of remaining PCBs in concrete. Applying the remediation goal (3.5 mg/kg) for total Aroclors in concrete, concrete containing total Aroclors at concentrations less than 3.5 mg/kg could be reused (as restricted use fill material) in localized areas of the Site, including high-occupancy [as defined in 40 CFR Section 761.61(a)(4)(i)(A)] areas that are capped. Regardless of the remedial alternative selected and implemented, it is assumed that the Site will undergo future new construction to include a commercial/industrial land use. As this assumption would be included with each alternative, institutional controls as a stand-alone alternative do not meet the RAOs for the Site and will not be evaluated further or included in subsequent remedial alternative evaluations.

#### **6.4.3 Ex Situ Treatment**

Ex situ treatment technologies that were considered for PCB-impacted concrete include demolition and disposal. The areas of known PCB impacts to concrete are shown on Figure 7. Demolition and disposal involves saw-cutting or breaking and removing PCB-impacted concrete with concentrations above the remediation goal, followed by transportation to an appropriate off-site disposal facility. PCB-impacted concrete containing total Aroclor concentrations greater than 1 mg/kg but less than the remediation goal of 3.5 mg/kg could be crushed and placed on-site as restricted use fill material (on-site disposal) in localized deeper areas. Demolition and disposal are retained for further consideration for addressing of PCB-impacted concrete present in former building slabs.

#### **6.4.4 In Situ Treatment**

In situ treatment technologies that were considered for PCB-impacted concrete include surficial scarification, encapsulation of intact surface slabs, and decontamination via steam cleaning.

Scarification is an effective treatment for removal of relatively thin surficial layers of concrete. Scarification is performed with grinding equipment that removes concrete layers in thicknesses equivalent to fractions of an inch, while generating noise and dust. Concrete dust associated with scarification would require collection and disposal. Depending on the desired depth of scarification, multiple passes of grinding equipment may be necessary. Additional confirmation sampling would then be necessary. This technology is generally not cost effective if removal depths exceed several inches. Coring data obtained from several areas within Buildings 104, 106, 108, and 112 indicate multiple layers of concrete are present, some with PCB-impacted lower layers overlaid by 2.5 to 4 inches of clean concrete. Scarification is not an effective treatment for this type of alternately impacted multi-layered concrete and is therefore not retained for further consideration.

Encapsulation or sealing of impacted concrete slabs involves physically microencapsulating wastes by sealing them with an applied compound. Encapsulation is typically performed with polymers, resins, or other proprietary binding and sealing compounds that are bonded to the impacted surface. Surface encapsulation effectiveness is limited to the success of the adhesive bond between the coating and the waste (U.S. EPA, 1982). Long term inspection and monitoring is also required to maintain integrity of the sealed areas. Encapsulation is not retained for further evaluation because bench-scale testing of multiple surface sealant compounds would need to be performed to determine the effectiveness of this alternative. Furthermore, surface encapsulation would require the slabs to be left in place. This would not allow demolition of existing below-grade foundations and footings that are being removed as a component of the Site remediation.

Steam cleaning or pressure washing is typically used to remove surficial impacts to both porous and non-porous surfaces. Steam cleaning or pressure washing is most effective on non-porous surfaces such as steel and less effective on porous or deeply impregnated stains. Steam cleaning or pressure washing would be performed as a decontamination step prior to slab demolition. Pressure-washing and steam cleaning of building slabs was performed as a general remediation technique prior to building demolition at the Site to remove surface accumulations of dust and oils. Post-demolition concrete coring and analytical testing in areas that were previously steam cleaned during above-ground demolition still contained areas where PCBs were detected above site-specific remediation goals. This demonstrates that steam cleaning is not an effective treatment technique for removing PCB impacts or heavily stained surfaces in porous concrete. Furthermore, steam cleaning is not an effective treatment because of the depth of penetration of the PCBs into the concrete slabs, and the presence of alternately contaminated multi-layered concrete slabs. Steam cleaning and pressure washing are not retained for further consideration.

## **7.0 DETAILED EVALUATION OF REMEDIAL ALTERNATIVES**

Section 6.0 screened the available technologies within each of the retained GRA categories, and identified the following remedial alternatives for additional detailed evaluation.

- No action;
- Excavation and offsite landfill disposal for surface and shallow COC-impacted soil and deep VOC-impacted soil;
- In situ stabilization of shallow COC-impacted metals, Stoddard solvent-impacted soil, and PCB-impacted soil;
- Capping of deeper PCB-impacted soil;

- SVE for shallow and deep VOC- and Stoddard solvent-impacted soil;
- SVE and bioventing for shallow and deep Stoddard solvent-impacted soil; and
- Demolition and disposal of PCB-impacted concrete.

These technologies are combined into potential alternatives for addressing COC-impacted areas at the Site and are further evaluated in Section 7.2 and summarized on Table 28.

## **7.1 EVALUATION CRITERIA**

The detailed evaluation process comprises the development and scoping of remedial alternatives to provide a basis for comparison using additional, more detailed criteria, referred to as balancing criteria, than those initially applied in the screening steps of the FS process. The balancing criteria include those developed by the U.S. EPA in the NCP 40 CFR 300.430(a)(1)(iii) and site-specific criteria developed for this project. Of the nine U.S. EPA balancing criteria, seven are discussed in this FS. The remaining two, acceptance by supporting agencies (such as the DTSC) and acceptance by the community, will be addressed when the supporting agencies and community have reviewed and commented on the RAP. These criteria are described in the following sections.

### **7.1.1 NCP-Based Evaluation Criteria**

NCP-based evaluation criteria are described below.

- Short-term effectiveness [40 CFR 300.430(e)(9)(iii)(E)]: An evaluation of alternatives using this criterion will identify the short-term effectiveness of various alternatives during implementation. As appropriate, the following factors will be addressed: protection of the community, protection of workers, and potential environmental impacts.
- Long-term effectiveness [40 CFR 300.430(e)(9)(iii)(C)]: An evaluation of alternatives using this criterion will define the anticipated results of the RAO in terms of achieving the long-term RAO of COC mass removal and identify the conditions that may remain at the Site after the RAO has been met. Evaluation of the alternatives will also include factors such as treatment residuals.
- Implementability [40 CFR 300.430(e)(9)(iii)(F)]: An evaluation of alternatives using this criterion will identify the technical and administrative feasibility of implementing an alternative. Factors to be considered may include construction and operation, duration monitoring considerations, permits required, and availability of necessary services and materials.
- Overall protection of human health and the environment [40 CFR 300.430(e)(9)(iii)(A)]: An evaluation of alternatives using this criterion will identify how the alternative as a whole achieves, maintains, or supports protection of human health and the environment.

- Compliance with ARARs and implementing agency requirements [40 CFR 300.430(e)(9)(iii)(B)]: An evaluation of alternatives using this criterion will identify how the alternative complies with applicable federal/state/local requirements and guidelines.
- Reduction of toxicity, mobility, or volume through treatment [40 CFR 300.430(e)(9)(iii)(D)]: An evaluation of alternatives using this criterion will define the anticipated performance of the specific treatment technology. The evaluation would consider the amount of COC that will be treated, the degree of expected reduction in toxicity and mobility of the COC, the type and quantity of treatment residuals that will remain, and the degree to which the treatment will be irreversible.
- Cost [40 CFR 300.430(e)(9)(iii)(G)]: This assessment will evaluate the capital and operation and maintenance (O&M) costs for each alternative. The cost estimates will be assessed as capital cost, annual O&M cost, and present worth analysis.

### 7.1.2 Site-Specific Evaluation Criteria

Site-specific evaluation criteria are described below.

- Applicability based on Site conditions: An evaluation of alternatives using this criterion will identify the applicability of various alternatives relative to site-specific conditions such as hydrogeology, distribution of the COCs in soil and concrete, impacts on neighboring properties, access restrictions, future land use, and lease and legal issues.
- Time required for planning, design, permitting, construction, and operation: An evaluation of alternatives using this criterion will identify project-specific needs to conduct work within a period of time and identify the steps necessary to prepare for and accomplish that work.
- Integration with other project elements: An evaluation of alternatives using this criterion will identify the extent to which an alternative is integrated and consistent with other known project elements and activities.

## 7.2 DESCRIPTION AND EVALUATION OF REMEDIAL ALTERNATIVES

This section describes the remedial alternatives that were retained from the evaluation performed in Section 6.0 to address each remedial COC. These alternatives are described below. Each alternative is then evaluated against the NCP 40 CFR 300.430(e)(9)(iii) evaluation criteria presented in Section 7.1.1 and summarized in Table 28.

### 7.2.1 Alternative 1

#### No Action

Alternative 1 consists of “No Action” and is included for evaluation pursuant to NCP 40 CFR 300.430(e)(6) and retained for comparison purposes. No below-grade demolition or soil remediation would be performed.



- **Overall Protection of Human Health and the Environment**  
No Action would not be protective of human health and the environment and would not meet the RAOs for the Site.
- **Compliance with ARARs**  
This alternative will not meet ARARs in a reasonable time frame.
- **Long-Term Effectiveness**  
No Action would not achieve the RAOs for the Site.
- **Reduction of Toxicity, Mobility, and Volume through Treatment**  
This alternative would provide limited reduction of toxicity, mobility, and volume with implementation.
- **Short-Term Effectiveness**  
No Action would not achieve the RAOs for the Site.
- **Implementability**  
There is no additional effort required for implementation of this alternative.
- **Costs**  
There are no costs associated with this alternative.

The Site may have a future commercial or industrial land use. These construction activities would require below-grade demolition and soil remediation. In addition, the "No Action" alternative fails to meet the RAOs for the Site. "No Action" is not a viable alternative.

### 7.2.2 Alternative 2

#### **Excavation and Disposal of COC-Impacted Soil and Demolition and Disposal of PCB-Impacted Concrete**

Alternative 2 consists of excavation and off-site disposal of shallow and deep COC-impacted soil (metals, PCBs, Stoddard solvent, and VOCs) to depths of approximately 8 feet bgs for metals, 15 feet bgs for PCBs, and 45 to 50 feet bgs for VOCs and Stoddard solvent. Vadose zone VOC remediation will promote a reduction in VOC concentrations in groundwater beneath the northern portion of the Site. Excavation will require installation of shoring for sidewall stability and safety during soil removal. This alternative also includes demolition and off-site disposal of concrete slabs containing PCB concentrations greater than or equal to 3.5 mg/kg. PCB-impacted concrete at concentrations greater than 1.0 mg/kg and less than 3.5 mg/kg would be crushed and deposited on-site as restricted use fill material (i.e., on site disposal) and covered with an interim cap consisting of a visual identifier layer and a minimum of 12-inches of clean crushed concrete (unrestricted use fill material). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on-site as unrestricted use fill material. A land use covenant that incorporates an operation and maintenance (O&M) plan and soil management plan would also be included in this alternative.

- **Overall Protection of Human Health and the Environment**

This alternative would meet the RAOs of mitigating shallow COC-impacted soils and PCB-impacted concrete above the site-specific remediation goals for the Site. Excavation poses no overall element of risk to human health or the environment.

- **Compliance with ARARs**

This alternative would be protective of human health and environment and would be expected to meet ARARs.

- **Long-Term Effectiveness**

This alternative would prevent human exposure by eliminating pathways between future receptors and soil, soil vapors, recycled concrete, and airborne dusts.

Removal of VOC-impacted soil in the northern portion of the Site will promote long-term natural attenuation of VOCs in groundwater.

- **Reduction of Toxicity, Mobility, and Volume through Treatment**

This alternative would reduce the toxicity, mobility, and volume of COC-impacted soils and PCB-impacted concrete.

- **Short-Term Effectiveness**

Risk to receptors and the environment is low if appropriate personal protective equipment (PPE) is worn by workers and dust, noise, and odor controls are implemented.

- **Implementability**

The technologies in this alternative are reliable and effective. Impacted areas would need to be well defined, and implementation is relatively straightforward using commercially available equipment. Shoring or other stability controls are required during excavation.

- **Costs**

Costs for this alternative were based on an excavation rate of 500 cubic yards per day and confirmation sample rate of one sample per 200 cubic yards of excavated material. Shoring costs are included in all proposed excavation areas greater than 10 feet bgs. Waste management costs associated with landfill disposal of soils impacted with metals, VOCs, and Stoddard solvent were estimated assuming that 90 percent of the soil waste is classified as a non-hazardous waste and 10 percent of the soil waste is classified as a hazardous waste. PCB soil waste disposal assumes 30 percent is classified as non-TSCA waste and 70 percent is TSCA waste. Average thickness of the PCB-impacted concrete slabs was assumed to be 12 inches. Estimated total capital cost for this alternative is \$33,200,000 and summarized in Appendix G.

Excavation and disposal of all COC-impacted materials is a proven and reliable technology. Because of the required excavation depths for deeper soil, it is also relatively more expensive than other competing technologies.

### 7.2.3 Alternative 3

#### **Excavation and Disposal of Shallow COC-Impacted Soil, SVE for Shallow and Deep VOC-Impacted Soil, SVE and Bioventing for Shallow and Deep Stoddard Solvent-Impacted Soil, and Demolition and Disposal of PCB-Impacted Concrete**

Alternative 3 consists of excavation and off-site disposal of shallow COC-impacted soil (PCBs and metals) to depths of approximately 15 feet bgs. Shallow and deep VOC- and Stoddard solvent-impacted soil would be mitigated using SVE and SVE with bioventing, respectively. Vadose zone VOC remediation will promote a reduction in VOC concentrations in groundwater beneath the northern portion of the Site. Deeper soil (at depths greater than 15 feet) impacted with PCBs above the remediation goal would be left in place and covered with a physical barrier at depth. The physical barrier would consist of 6 inches of cement concrete. This alternative also includes demolition and off-site disposal of PCB-impacted concrete slabs containing PCB concentrations greater than 3.5 mg/kg. PCB-impacted concrete at concentrations greater than 1.0 mg/kg and less than 3.5 mg/kg would be crushed and deposited on-site as restricted use fill material (i.e., on-site disposal) and covered with an interim cap consisting of a visual identifier layer and a minimum of 12-inches of clean crushed concrete (unrestricted use fill material). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on-site as unrestricted use fill material. A land use covenant that incorporates an O&M plan and soil management plan would also be included in this alternative.

- **Overall Protection of Human Health and the Environment**

This alternative would meet the RAOs of mitigating shallow COC-impacted soils, PCB-impacted concrete, and deeper VOC- and Stoddard solvent-impacted soils above the site-specific remediation goals for the Site. Excavation, SVE and bioventing pose no overall element of risk to human health or the environment.

- **Compliance with ARARs**

This alternative would be protective of human health and environment and would be expected to meet ARARs.

- **Long-Term Effectiveness**

This alternative would prevent human exposure by eliminating pathways between future receptors and soil, soil vapors, recycled concrete and airborne dusts. In addition, SVE and bioventing are presumptive remedies and can achieve site-specific remediation goals for VOC- and Stoddard solvent-impacted soils. Remediation of the VOC-impacted soil in the northern portion of the Site will promote long-term natural attenuation of VOCs in groundwater.

- **Reduction of Toxicity, Mobility, and Volume through Treatment**

This alternative would reduce the toxicity, mobility, and volume of shallow and deep COC-impacted soils and PCB-impacted concrete.

- **Short-Term Effectiveness**

Risk to receptors and the environment is low if appropriate PPE is worn by workers and dust, noise, and odor controls are implemented.

- **Implementability**

The technologies in this alternative are presumptive remedies documented to be reliable and effective. Impacted areas would need to be well defined, and implementation is relatively straightforward using commercially available equipment and effective monitoring programs for the SVE and bioventing systems. Shoring or other stability controls are required during excavation. Necessary permits must be obtained for operation of the SVE systems along with a monitoring and reporting program after system start-up.

- **Costs**

Costs for this alternative were based on an excavation rate of 500 cubic yards per day and confirmation sample rate of one sample per 200 cubic yards of excavated material. Shoring costs are included in all proposed excavation areas greater than 10 feet bgs. Waste management costs associated with landfill disposal were estimated assuming that 30 percent of the soil waste is classified as a non-TSCA waste and 70 percent of the soil waste is classified as a TSCA waste. Average thickness of the PCB-impacted concrete slabs was assumed to be 12 inches. SVE costs include rental of a minimum 1000 cubic feet per minute (cfm) system with continued operation over a three year period. Bioventing costs include operation of a SVE system for three months followed by operation of a low-flow, pulsed air injection system over a three year period. Estimated total capital cost for this alternative is \$4,400,000 and summarized in Appendix G.

Excavation and disposal of shallow COC-impacted materials, along with SVE for shallow and deep VOC-impacted soils, and SVE with bioventing for Stoddard solvent-impacted soils, meet the RAOs for the Site and provides a balanced alternative that is both cost-effective and protective of human health and the environment.

#### 7.2.4 Alternative 4

##### **In Situ Stabilization of Shallow PCB/Metals-Impacted Soil and Deep Stoddard Solvent-Impacted Soil, SVE for Shallow and Deep VOC-Impacted Soil, and Demolition and Disposal of PCB-Impacted Concrete.**

Alternative 4 consists of in situ stabilization of shallow PCB- and metals-impacted soil and deep Stoddard solvent-impacted soil, using a cement-based additive to depths of approximately 15 feet bgs for PCB- and metals-impacted soil and 50 feet bgs for Stoddard solvent-impacted soil. Shallow and deep VOC-impacted soil would be addressed using SVE. Vadose zone VOC remediation will promote a reduction in VOC concentrations in groundwater beneath the northern portion of the Site. This alternative also includes demolition and off-site disposal of concrete slabs containing PCB concentrations greater than 3.5 mg/kg. PCB-impacted concrete at concentrations greater than 1.0 mg/kg and less than 3.5 mg/kg would be crushed and deposited on-site as restricted use fill material (i.e., on-site disposal) and covered

with an interim cap consisting of a visual identifier layer and a minimum of 12-inches of clean crushed concrete (unrestricted use fill material). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on-site as unrestricted use fill material. A land use covenant that incorporates an O&M plan and soil management plan would also be included in this alternative.

- **Overall Protection of Human Health and the Environment**

This alternative would not meet the RAOs of mitigating shallow and deep COC-impacted soils above the site-specific remediation goals because stabilization does not reduce the volume and may only partially reduce toxicity of COCs. PCB-impacted concrete and deeper COC-impacted soil RAOs for the Site would be met with this alternative. The technologies applied in this alternative pose no overall element of risk to human health or the environment.

- **Compliance with ARARs**

This alternative would be protective of human health and environment and would be expected to meet ARARs.

- **Long-Term Effectiveness**

This alternative would prevent human exposure by eliminating pathways between future receptors and soil, soil vapors, recycled concrete, and airborne dusts. In addition, SVE is a presumptive remedy and can achieve site-specific remediation goals for VOC-impacted soils. Remediation of the VOC-impacted soil in the northern portion of the Site will promote long-term natural attenuation of VOCs in groundwater.

- **Reduction of Toxicity, Mobility, and Volume through Treatment**

This alternative would reduce the toxicity, mobility, and volume of deeper VOC-impacted soils and PCB-impacted concrete. Soil stabilization would reduce the mobility of shallow and deep COC-impacted soils, but volume and toxicity would not be significantly reduced through treatment.

- **Short-Term Effectiveness**

Risk to receptors and the environment is low if appropriate PPE is worn by workers and dust, noise, and odor controls are implemented.

- **Implementability**

The technologies in this alternative are reliable and effective. Impacted areas would need to be well defined, but implementation of technologies is relatively straightforward. Soil stabilization requires a bench-scale test and mobilization of a large diameter crawler-mounted auger drilling rig. Necessary permits must be obtained for operation of the SVE system, along with a monitoring and reporting program after system start-up.

- **Costs**

Costs for this alternative were based on a stabilization rate of 300 cubic yards per day, maximum stabilization depth of 50 feet bgs, and a stockpile confirmation sample rate of one sample per 200 cubic yards. Cement-mixing-additive assumed to be 10 percent of the stabilization material for cost estimation purposes. Cost

assumes 20 percent of mixed volume requires off-site disposal. Waste management costs associated with landfill disposal were estimated assuming that 90 percent of the soil waste is classified as a non-hazardous waste and 10 percent of the soil waste is classified as a hazardous waste. Average thickness of the PCB-impacted concrete slabs was assumed to be 12 inches. SVE costs include rental of a minimum 1000 cfm system with continued operation over a three year period. Estimated total capital cost for this alternative is \$14,300,000 and summarized in Appendix G.

SVE is a presumptive remedy that is well-suited to address the VOC-impacted areas on the Site. Based on the large volumes of Stoddard solvent-impacted soil, in situ stabilization is more expensive than other technologies such as bioventing.

## 8.0 PROPOSED PREFERRED REMEDIAL ALTERNATIVES

This section describes the proposed preferred remedial alternative selected to mitigate the remedial COC scenarios evaluated through this FS process. Alternative 3 is the proposed preferred alternative and consists of excavation and off-site disposal of surface and shallow COC-impacted soil, placing a physical barrier over deeper PCB-impacted soil left in place (at depths below 15 feet), SVE for shallow and deep VOC-impacted soil, and SVE and bioventing for Stoddard solvent-impacted soil. In addition, remediation of VOC-impacted soil will promote long-term natural attenuation of VOCs in groundwater. PCB-impacted concrete with concentrations above the remediation goal in building slabs will be mitigated using demolition and off-site disposal. PCB-impacted concrete at concentrations greater than 1.0 mg/kg and less than 3.5 mg/kg would be crushed and deposited on-site as restricted use fill material (i.e., on site disposal). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on-site as unrestricted use fill material. A land use covenant that incorporates an O&M plan and soil management plan would also be included in this alternative. Alternative 3 is the most cost-effective alternative that meets both the short-term and long-term effectiveness criteria. It also provides for a greater reduction of toxicity, mobility, and volume when compared to Alternative 4 and it is protective of human health and the environment. The components of Alternative 3 are further described below.

### 8.1 DEMOLITION AND DISPOSAL OF PCB-IMPACTED CONCRETE

Concrete slabs with PCB concentrations that exceed the proposed site-specific remediation goal of 3.5 mg/kg will be demarcated in the field by marking the slab surface. PCB-impacted concrete slabs will then be saw cut or broken, removed, and transported off site for disposal at an appropriate landfill facility permitted to accept PCB remediation waste.

Concrete slabs with PCB concentrations greater than 1.0 mg/kg and less than 3.5 mg/kg will be demarcated in the field by marking the slab surface. PCB-impacted concrete slabs will then be saw cut or broken, and sized by crushing or pulverizing to facilitate handling. These

materials are proposed to be placed as restricted use backfill material (i.e., on site disposal) within the upper 15 feet in open excavation areas (such as Areas 4a and 4b shown on Figure 914) after COC-impacted soil removal has been completed. This restricted use fill location will then be covered with an interim cap as required by U.S. EPA, as will be proposed in the RAP.

## **8.2 EXCAVATION AND DISPOSAL OF SURFACE/SHALLOW COC-IMPACTED SOIL**

The proposed preferred remedial technology for surface and shallow COC-impacted soil containing PCBs, Stoddard solvent, and metals concentrations exceeding site-specific remediation goals is excavation and off-site disposal. Excavation activities will be followed by backfilling and compaction with crushed, recycled aggregates obtained from the on-site demolition and crushing of slabs and foundations as discussed in the RAP. In the unlikely event that additional fill is required, clean soil will be imported from an off-site source.

Deeper PCB-impacted soil (at depths greater than 15 feet) will be left in place (Areas 4a and 4b) and covered at depth with a physical barrier comprised of concrete, as proposed in the RAP.

## **8.3 SVE FOR SHALLOW AND DEEP VOC-IMPACTED SOIL**

The preferred remedial technology for shallow and deep VOC-impacted soil in the Phase I area is to install and operate an SVE system where VOC concentrations exceed site-specific remediation goals. The SVE system will be operated until VOC concentrations in the effluent air stream reach asymptotic conditions. The system will then be shut-down to undergo vapor rebound testing, followed by additional operations as necessary. System performance and termination of operations will be based on monitoring of in situ soil vapor concentrations obtained from soil vapor confirmation sampling performed after completion of vapor rebound testing and confirmation soil sampling. Post-remediation soil matrix confirmation sampling will be performed in previously defined VOC hot spot areas upon completion of rebound testing and termination of SVE. While future site use may limit physical access into certain areas, efforts will be made to obtain soil samples from approximate locations consistent with previous VOC characterization sampling events in the VOC impacted areas. Approximately six soil borings will be advanced to groundwater and eight soil samples per boring will be obtained from both above and below the fine grained unit. Samples will be analyzed for VOCs using U.S. EPA Method 8260B/5035. Soil sample results will be used to document the remaining concentrations of the VOCs in soil for a deed-land use covenant for the Site.

## **8.4 SVE AND BIOVENTING FOR SHALLOW AND DEEP STODDARD SOLVENT-IMPACTED SOIL**

The preferred remediation technology for shallow and deep Stoddard solvent-impacted soil in the Phase IIIb and Phase IV areas is to install and operate a SVE and bioventing system where Stoddard solvent COCs exceed site-specific remediation goals. SVE will be performed

initially to remove the volatile fraction of Stoddard solvent COCs. The system will then be reconfigured to operate as a bioventing system to address the remaining Stoddard solvent-impacted soil.

Bioventing is a soil bioremediation technology that involves aeration of soils to stimulate and promote biodegradation of fuel-related hydrocarbon constituents. In contrast to SVE, bioventing uses low air flow rates only to provide oxygen to sustain microbial activity. The addition of nutrients and moisture is typically not required (AFCEE, 1996a). Bioventing relies on forced air injection (or vacuum venting) to deliver oxygen that is required to maintain the biodegradation process. Oxygen is most commonly supplied through screened vent wells similar to those used in SVE systems. In addition to degradation of absorbed hydrocarbon residuals, residual volatile compounds are biodegraded as vapor moves slowly through biologically active soil.

Oxygen is generally the limiting factor with intrinsic aerobic bioremediation, becoming depleted because respiration rates generally exceed rates of oxygen recharge via natural diffusion. Bioventing enhances and accelerates the natural biodegradation process by providing oxygen as a source of electron acceptors to naturally-occurring microorganisms. These microorganisms degrade the fuel hydrocarbon constituents by using them as a carbon source for cell production that generates carbon dioxide during respiration. Although soil microorganisms are capable of degrading fuel hydrocarbons under both anaerobic and aerobic conditions, biodegradation rates are typically much faster under aerobic conditions.

Bioventing treatability studies have been demonstrated at over 145 U.S. Air Force sites and regulatory acceptance of bioventing remedies has been achieved in 38 states (including California) and all 10 U.S. EPA regions (AFCEE, 1996b).

Soil gas monitoring will consist of measuring the concentrations of carbon dioxide, oxygen, and methane in the vent wells. The system will be operated until soil gas monitoring results collected from the vent wells indicate biodegradation is complete. Soil confirmation sampling will then be performed. Post-remediation soil matrix confirmation sampling will be performed in previously defined hot spot areas upon completion of bioventing to substantiate treatment completion and, if necessary, to support a ~~deed~~land use covenant for the Site.

## 9.0 PUBLIC PARTICIPATION

As required by the NCP 40 CFR 300.430(c)(1) and DTSC, Pechiney will ensure that the public is informed and has the opportunity to participate in the overall remedial action for the Site. A comprehensive community involvement plan will be submitted following the submittal of the FS



and RAP. Public participation will be implemented as part of demolition and remediation of the Site. The community involvement program and activities are described below.

## **9.1 COMMUNITY INVOLVEMENT PROGRAM**

The objective of the community involvement program is to inform the community of the progress of demolition and remediation activities and to effectively respond to health, environment and safety concerns and questions. The community involvement program will be consistent with DTSC requirements and CERCLA as implemented by the NCP 40 CFR 300.430(c)(1). The purpose of these activities as stated by the NCP 40 CFR 300.430(c)(2)(ii)(A) is to “ensure the public appropriate opportunities for involvement in a wide variety of Site related decisions, including Site analysis and characterization, alternatives analysis, and selection of remedy; and to determine, based on community interviews, appropriate activities to ensure such public involvement.”

Objectives of the community involvement program include:

- soliciting input from the community on concerns about the remedial activities;
- establishing effective channels of communication between the community, Pechiney, and DTSC;
- informing the community about progress of the remedial activities; and
- providing adequate opportunities for the community to participate and comment on the proposed remedial activities.

## **9.2 COMMUNITY INVOLVEMENT ACTIVITIES**

To date, Pechiney has conducted community outreach activities to its immediate neighbors including face-to-face visits from the project and field engineers. As part of the below-grade demolition phase of the project, DTSC has begun the community interviews and may distribute information to the immediate neighbors of the Site including proposed activities and schedule of work.

Prior to the start of remediation, DTSC will expand its outreach and distribute an information fact sheet to businesses and residents surrounding the Site and to other interested stakeholders. This fact sheet will include information about the Site, remedial activities, and project contacts. Additionally, a local information repository will be established to make documents and other information available for the public and a Site mailing list will be developed.

The RAP will be made available to the public for a comment period of at least 30 days. DTSC will respond to any comments received during the public comment period and will provide a timely opportunity for the public to access documents.

Depending on the level of community response and level of interest, DTSC may hold a community meeting to discuss the components of the RAP, the Site's history, and proposed remedial work. The meeting may also provide the opportunity for the public to submit comments on the RAP. DTSC will work with the community to develop a meeting format that suits the community's needs.

## 10.0 REFERENCES

- Air Force Center for Environmental Excellence (AFCEE), 1996a, A General Evaluation of Bioventing for Removal Actions at Air Force/Department of defense Installations Nationwide, General Engineering Evaluation/Cost Analysis, June.
- AFCEE, 1996b, Bioventing Performance and Cost Results from Multiple Air Force Test Sites, Technology Demonstration Final Technical Memorandum, June.
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TABLE 19

**SUMMARY OF MAXIMUM PREDICTED LIFETIME EXCESS CANCER RISKS  
AND NONCANCER HAZARD INDEXES – CUMULATIVE SOIL AND SOIL VAPOR EXPOSURE**

Former Pechiney Cast Plate, Inc., Facility  
Vernon, California

Area	Cancer Risks			Noncancer HIs		
	Indoor Commercial/Industrial Worker	Outdoor Commercial/Industrial Worker	Construction Worker	Indoor Commercial/Industrial Worker	Outdoor Commercial/Industrial Worker	Construction Worker
Phase I	<b>4E-04</b>	<b>2E-03</b>	<b>3E-04</b>	<b>2</b>	0.02	0.2
Phase II	6E-07	<b>4E-03</b>	<b>6E-04</b>	0.004	<b>3</b>	<b>10</b>
Phase IIIa	-- <sup>1</sup>	<b>1E-04</b>	<b>2E-05</b>	-- <sup>1</sup>	1	<b>7</b>
Phase IIIb	3E-07	3E-07	5E-08	<b>53</b>	1	<b>4</b>
Phase IV	3E-07	<b>1E-04</b>	<b>2E-05</b>	<b>38</b>	2	<b>18</b>
Phase V	1E-07	5E-10	2E-08	0.002	0.003	0.03
Phase VI	-- <sup>1</sup>	<b>6E-05</b>	<b>1E-05</b>	-- <sup>1</sup>	0.4	<b>5</b>

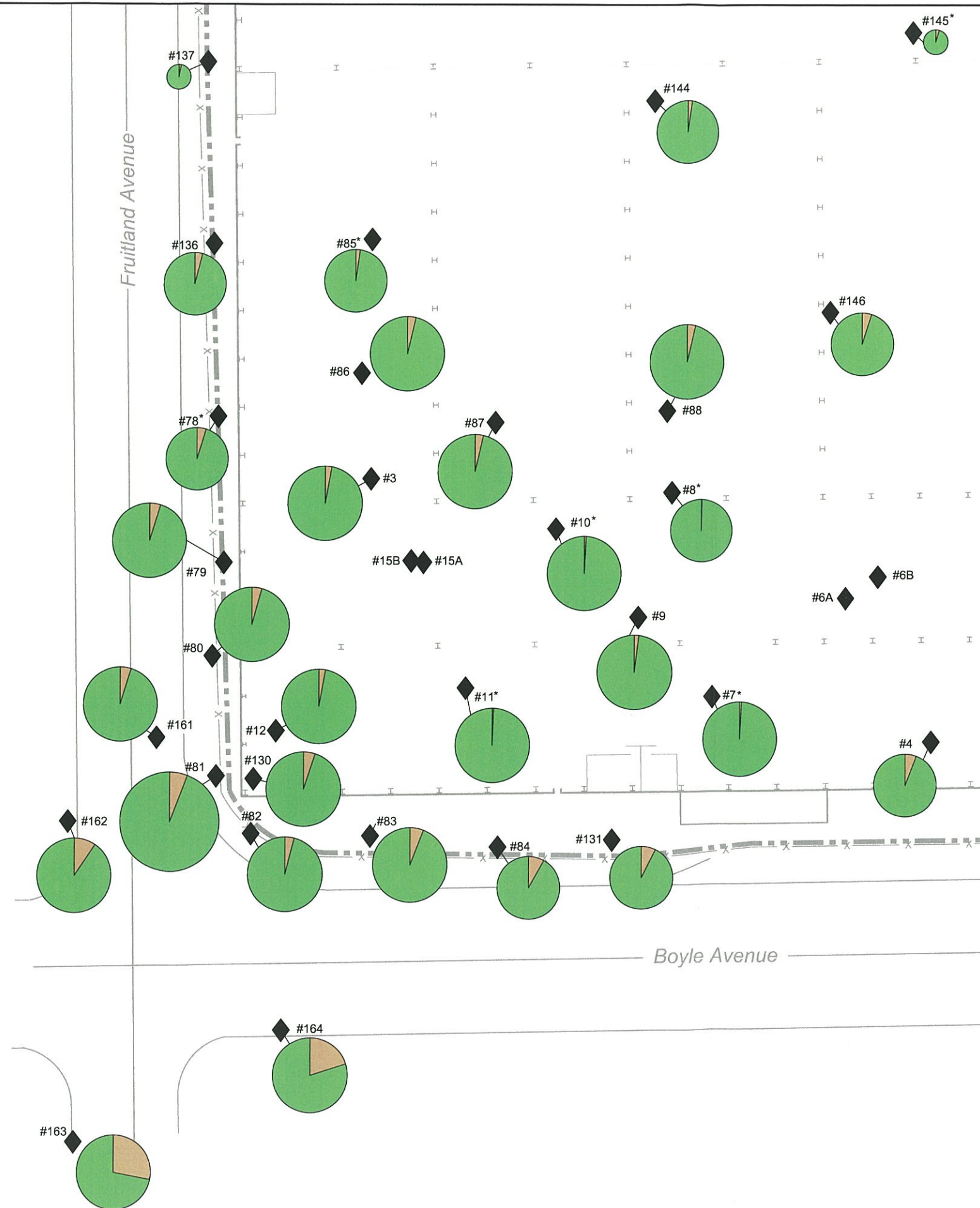
Notes:

1. Cancer risks and HIs above DTSC points of departure (a cumulative lifetime excess cancer risk of  $1 \times 10^{-6}$ ; an HI of 1) are **bold**.
2. No volatile organic compounds (VOCs) were detected in soil or soil vapor in the Phase IIIa and Phase VI areas.

Abbreviations:

- HI = hazard index  
-- = not applicable

Plot Date: 04/23/12 - 4:14pm, Plotted by: pat herring  
Drawing Path: Y:\10627\003\0acat\Reports\_2012\FIS\_2012\, Drawing Name: tb\_Distribution of PCE to TCE.dwg



## Explanation

#164 ♦ Geomatrix soil vapor sampling point

--- Property boundary

Total molar concentration of tetrachloroethene (PCE) and trichloroethene (TCE) in soil vapor at 5 feet below ground surface

○ <0.1

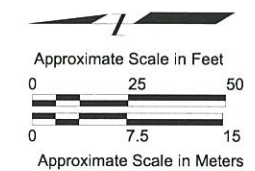
○ ≥0.1 and <1.0

○ ≥1.0 and <10

○ ≥10

Ratio of molar concentration of PCE to TCE

#78\* ♦ PCE or TCE concentration was below the detection limit; ratio calculated using 0.5 of the report limit



Basemap modified from Pechiney Cast Plate, Inc. Site Plan dated January 8, 2002, Geraghty & Miller, Inc. "Groundwater Elevation and Volatile Organic Compound Concentrations December 8, 1994" Figure dated February 2, 1995, Aluminum Company of America "Works General-Map" figure dated October 10, 1984, and Los Angeles County Assessor's Office Parcel Map 6310 / Sheet 8 dated November 5, 1958.

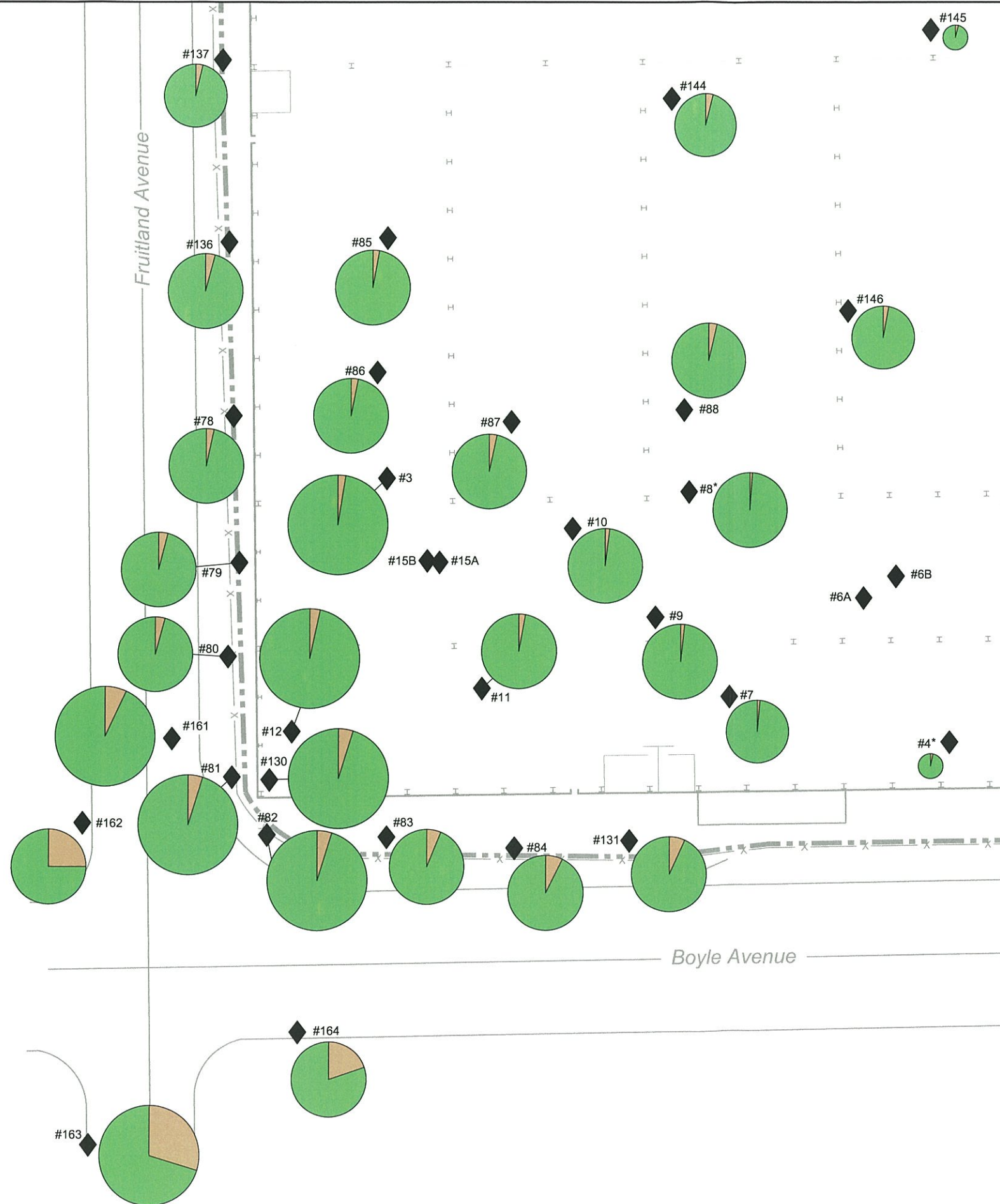
DISTRIBUTION OF PCE TO TCE  
IN SOIL VAPOR AT 5 FEET  
Former Pechiney Cast Plate, Inc., Facility  
3200 Fruitland Avenue  
Vernon, California

By: pah Date: 04/23/12 Project No. 10627.003

amec

Figure 8

Plot Date: 04/23/12 - 4:12pm. Plotted by: pat.herring  
Drawing Path: Y:\10627.003\06cad\Reports\_2012\Fs\_2012\ Drawing Name: 1b\_Distribution of PCE to TCE .dwg



### Explanation

#164 ♦ Geomatrix soil vapor sampling point

--- Property boundary

Total molar concentration of tetrachloroethene (PCE) and trichloroethene (TCE) in soil vapor at 15 feet below ground surface

○ <0.1

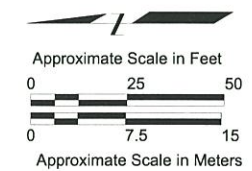
○ ≥0.1 and <1.0

○ ≥1.0 and <10

○ ≥10

Ratio of molar concentration of PCE to TCE

#4\* ♦ PCE or TCE concentration was below the detection limit; ratio calculated using 0.5 of the report limit



Basemap modified from Pechiney Cast Plate, Inc. Site Plan dated January 8, 2002, Geraghty & Miller, Inc. "Groundwater Elevation and Volatile Organic Compound Concentrations December 8, 1994" Figure dated February 2, 1995, Aluminum Company of America "Works General-Map" figure dated October 10, 1984, and Los Angeles County Assessor's Office Parcel Map 6310 / Sheet 8 dated November 5, 1958.

DISTRIBUTION OF PCE TO TCE  
IN SOIL VAPOR AT 15 FEET  
Former Pechiney Cast Plate, Inc., Facility  
3200 Fruitland Avenue  
Vernon, California

By: pah Date: 04/23/12 Project No. 10627.003

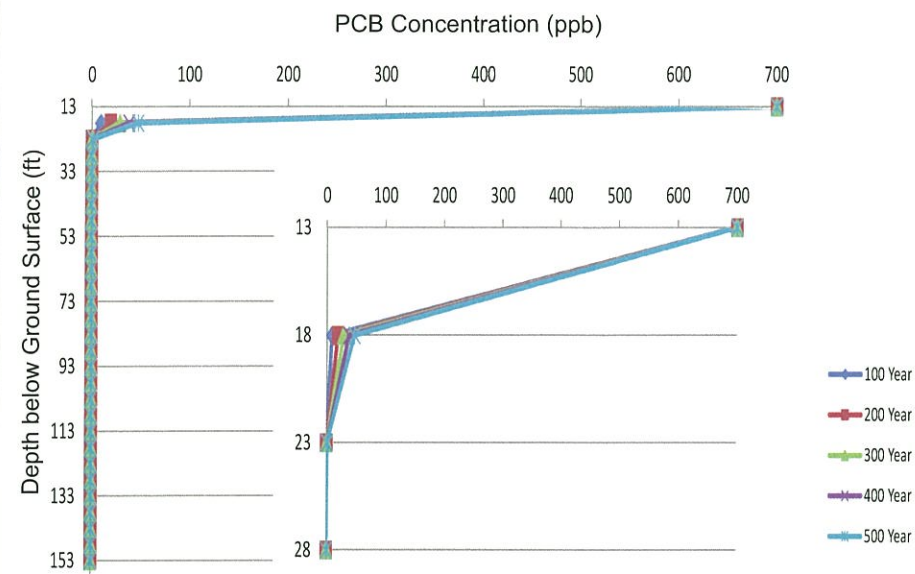
amec

Figure 9

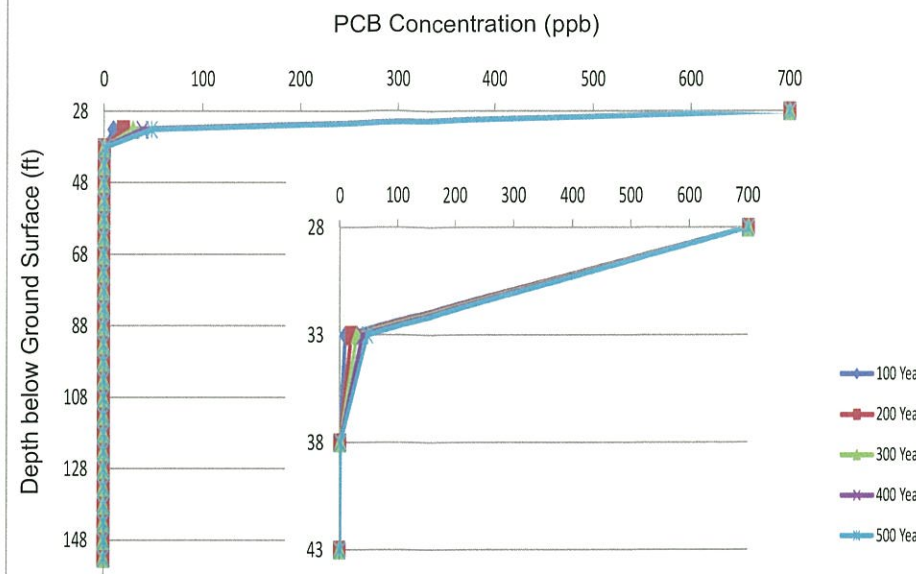


y:\10627.003\0\acad\Reprots\_2012\FS\_2012\PCB\_soil\_15-3-45 ft.cdr

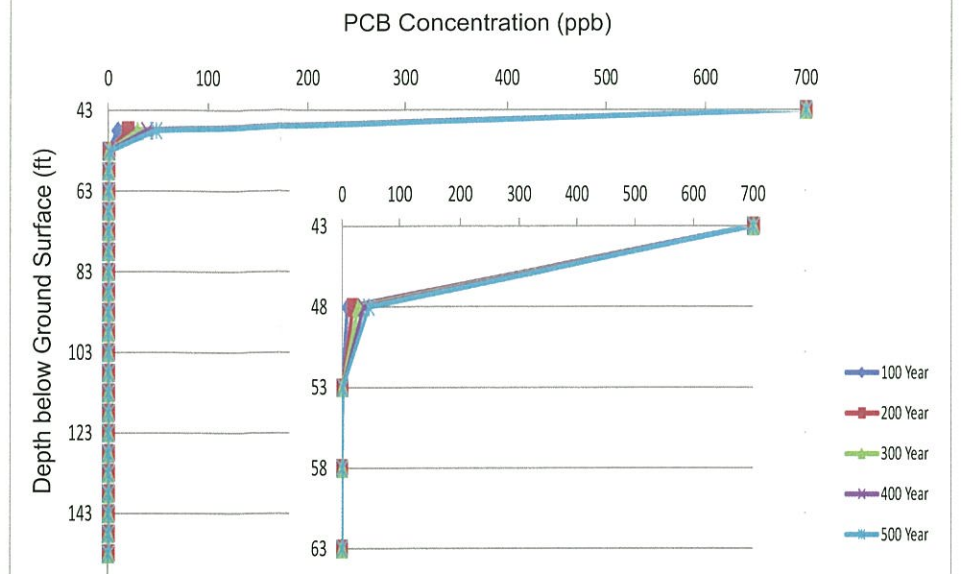
Simulated PCB Concentration Profiles over Time  
PCBs in soil at 15 feet bgs  
(retardation factor based on properties)



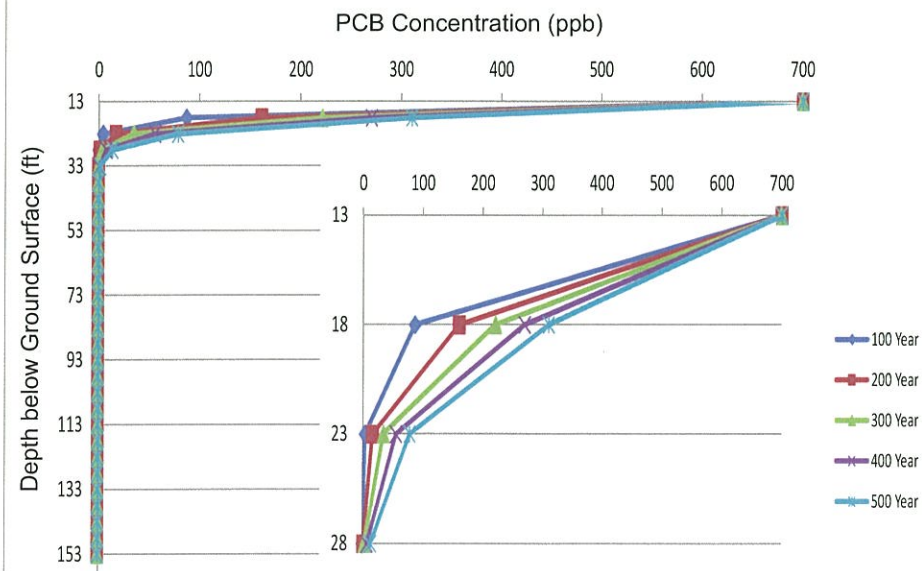
Simulated PCB Concentration Profiles over Time  
PCBs in soil at 30 feet bgs  
(retardation factor based on properties)



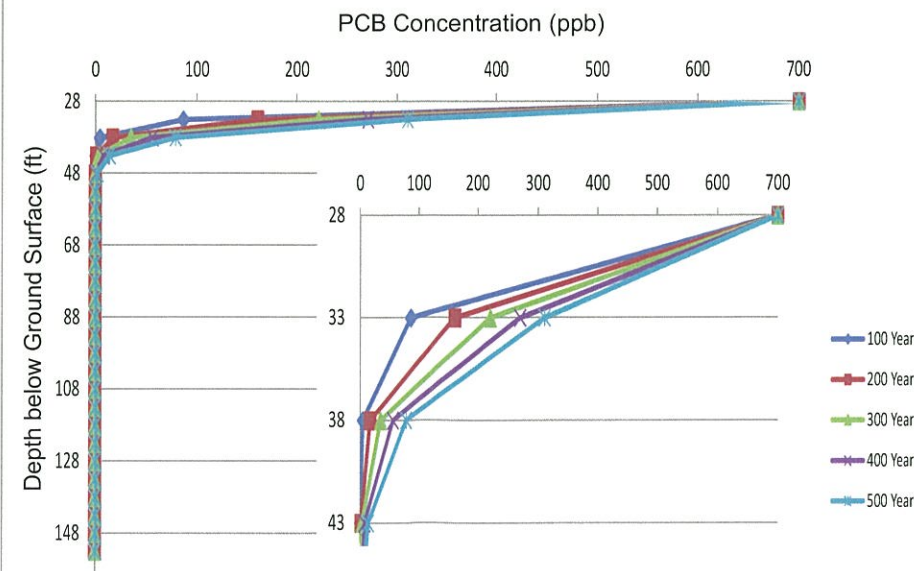
Simulated PCB Concentration Profiles over Time  
PCBs in soil at 45 feet bgs  
(retardation factor based on properties)



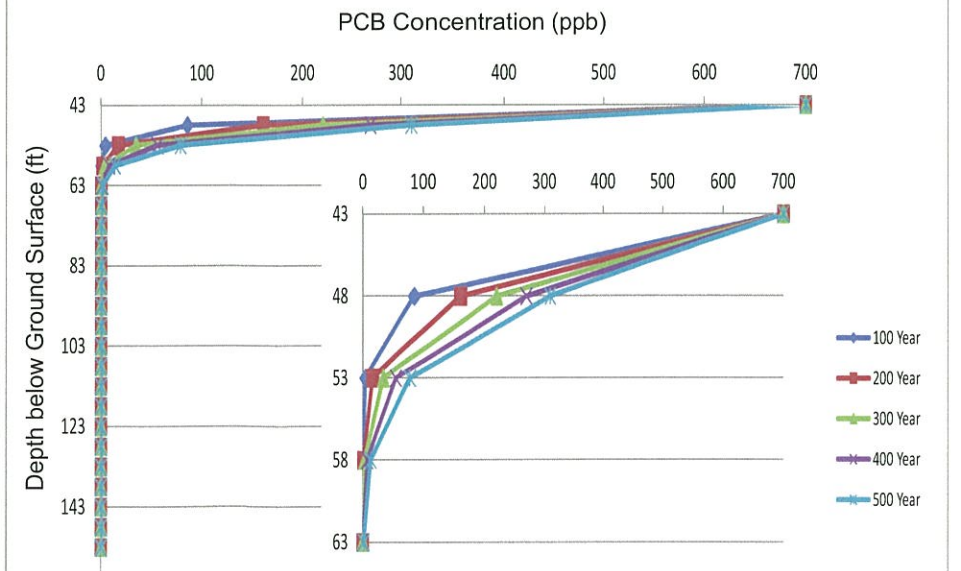
Simulated PCB Concentration Profiles over Time  
PCBs in soil at 15 feet bgs  
(retardation factor = 10 percent of value based on properties)



Simulated PCB Concentration Profiles over Time  
PCBs in soil at 30 feet bgs  
(retardation factor = 10 percent of value based on properties)



Simulated PCB Concentration Profiles over Time  
PCBs in soil at 45 feet bgs  
(retardation factor = 10 percent of value based on properties)



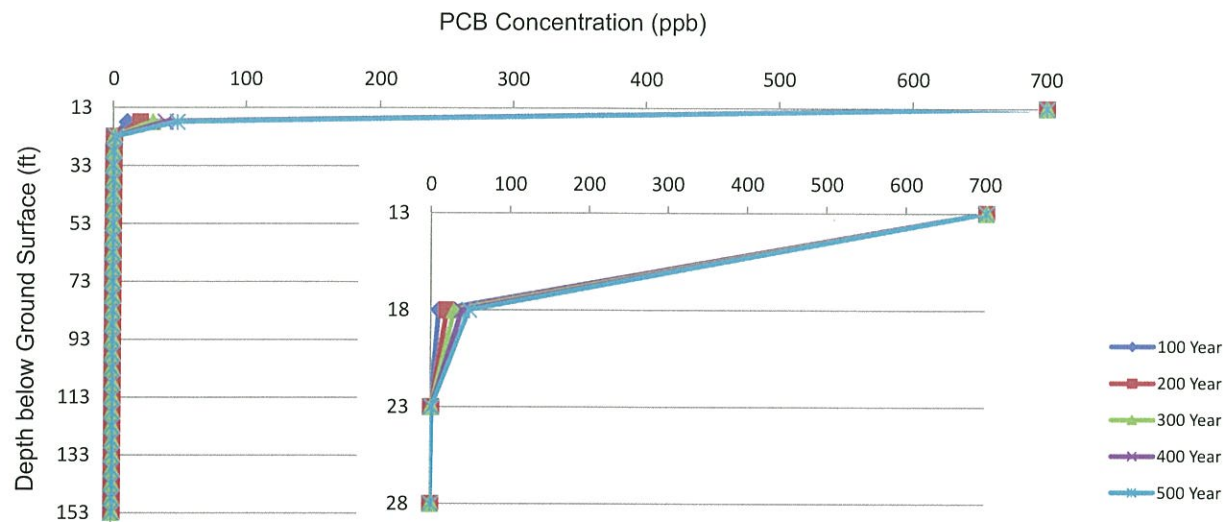
SIMULATED PCB CONCENTRATION PROFILES FOR  
SOIL AT 15, 30, AND 45 FEET  
Former Pechiney Cast Plate, Inc., Facility  
3200 Fruitland Avenue  
Vernon, California

By: pah Date: 04/23/12 Project No. 10627.003

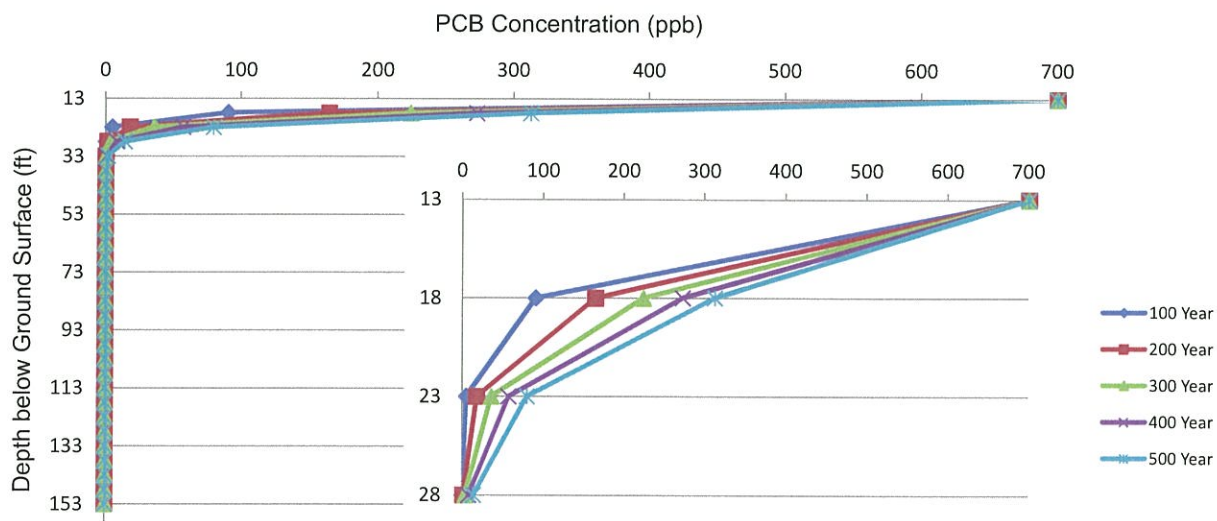


Figure 11

Simulated PCB Concentration Profiles over Time  
PCBs in crushed concrete 5 feet bgs  
(retardation factor based on properties)



Simulated PCB Concentration Profiles over Time  
PCBs in crushed concrete 5 feet bgs  
(retardation factor = 10 percent of value based on properties)



SIMULATED PCB CONCENTRATIONS PROFILES  
FOR CRUSHED CONCRETE AT 15 FEET  
Former Pechiney Cast Plate, Inc., Facility  
3200 Fruitland Avenue  
Vernon, California

By: pah

Date: 04/23/12

Project No. 10627.003



Figure 12

## APPENDIX D

### SITE-SPECIFIC MODELING AND DEVELOPMENT OF SCREENING LEVELS FOR THE PROTECTION OF GROUNDWATER

#### 1. CALCULATIONS OF SITE-SPECIFIC SOIL SCREENING LEVELS FOR VOLATILE ORGANIC COMPOUND (VOC) CHEMICALS OF POTENTIAL CONCERN (COPCs) FOR PROTECTION OF GROUNDWATER

The site-specific soil screening levels at various depths for the VOC COPCs listed in Section 4.3 of the Feasibility Study (FS) were estimated following the procedures based on the Attenuation Factor (AF) Method developed by the California Regional Water Quality Control Board (RWQCB), Los Angeles Region in their guidance document "Interim Site Assessment & Cleanup Guidebook." The calculations were implemented in Mathcad® (Parametric Technology Corporation, 2007)<sup>1</sup> worksheets. Mathcad® is a general-purpose mathematical analysis software that is commercially available.

When available, the maximum attenuation factors (AFmax) in the Los Angeles RWQCB guidance document were used. For other VOCs that do not have AFmax in the guidance document, the maximum attenuation factors were calculated from properties of the VOCs following the procedure in the Los Angeles RWQCB guidance document. The VOC properties used in the calculation of AFmax were obtained using the U.S. EPA document "Region IX Preliminary Remediation Goals" (2004),<sup>2</sup> with the exception of isopropyltoluene. The references for the properties of isopropyltoluene were listed in the corresponding Mathcad® worksheet.

Modification factors for the distance above groundwater were applied to the maximum attenuation factors using equations 5 through 7 in the Los Angeles RWQCB guidance document. Modification factors for lithology were then applied to the attenuation factors using equation 12 in the Los Angeles RWQCB guidance document. The site-specific lithologic profile interpreted based on the logs of borings 125 and 126 were used in the calculations. At each depth interval, the lithologic unit was classified as gravel, sand, silt, or clay layer. Finally, site-specific soil screening levels were calculated using the attenuation factors (modified for distance to groundwater and lithology) and maximum allowable concentrations in groundwater. The California Department of Public Health (DPH) maximum contaminant levels (MCLs) were used to calculate the site-specific soil screening levels. In cases where a compound did not

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<sup>1</sup> Parametric Technology Corporation, 2007, Mathcad (version 14.0), Needham, Massachusetts, February.

<sup>2</sup> U.S. Environmental Protection Agency (EPA), 2004, Region IX Preliminary Remediation Goals, (PRGs) 2004.



have a State or Federal MCL, the DPH notification level was used, with the exception of Isopropyltoluene. Because no DPH notification level is available for isopropyltoluene, the DPH notification level for isopropylbenzene was used as a surrogate. The calculations for the soil screening levels for the VOC COPCs are presented in Worksheets D-1 through D-14.

## **2. SITE-SPECIFIC MODELING OF PCBS IN SOIL AND CONCRETE FOR PROTECTION OF GROUNDWATER**

Use of the AF Method in the Los Angeles RWQCB guidance document to evaluate polychlorinated biphenyls (PCBs) in soil and concrete for potential impacts to groundwater is not appropriate because PCBs have significantly higher soil sorption than VOCs for which the AF Method is applicable. The AF Method assumes that the fate and transport processes of VOCs in vadose zone have reached steady state. However, because PCBs have significantly higher soil sorption, the transport of PCBs in vadose zone soil is highly retarded. As a result, the PCB concentrations in vadose zone soil between the source and groundwater table tend to be in a transient condition that occurs long after the initial release. In addition, the modification factor due to distance above groundwater in the AF Method is based on an assumed linear relationship between AF and the distance above groundwater. The linear relationship in the Los Angeles RWQCB guidance document is based on a study of VOC downward transport using a one-dimensional vadose zone transport model, VLEACH (Ravi and Johnson, 1994).<sup>3</sup> Because PCBs have a significantly higher soil sorption than the VOCs, the relationship between AF and the distance above groundwater is likely very different from the relationship used in the AF Method. Without establishing this relationship for PCBs using the VLEACH model, the AF Method is inappropriate to use for PCBs. Instead, numerical simulations were performed to simulate the fate and transport of PCBs in a one-dimensional soil column in the vadose zone. The model developed for PCB attenuation analysis is described below.

The modeling was performed using commercial software, MODFLOW-SURFACT (HydroGeologic, Inc., 2006),<sup>4</sup> which is similar to VLEACH. The code for this software is based on the most commonly used groundwater modeling software, MODFLOW (Harbaugh et., al., 2000),<sup>5</sup> released by the United States Geological Survey. The MODFLOW-SURFACT code has an additional capability to simulate the moisture movement as well as the fate and transport of chemicals in the vadose zone using the Van Genuchten's model. This code was selected because it was supported by a commonly used MODFLOW pre- and post-processing

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<sup>3</sup> Ravi, V. and J.A. Johnson, 1994, VLEACH (version 2.1), Center for Subsurface Modeling Support, Robert Kerr Environmental Research Laboratory, Ada, Oklahoma.

<sup>4</sup> HydroGeologic, Inc., 2006, MODFLOW-SURFACT (version 3.0), Reston, Virginia, May.

<sup>5</sup> Harbaugh, A.W., E.R. Banta, M.C. Hill, and M.G. McDonald, 2000, MODFLOW-2000, The U.S. Geological Survey Modular Ground-water Model – User Guide to Modularization Concepts and the Ground-Water Flow Process: U.S. Geological Survey Open-File Report 00-92, p. 121.

graphical user interface software, Groundwater Vista<sup>®</sup>, which was released by Environmental Simulation, Inc. (2007).<sup>6</sup>

## 2.1 MODEL CONSTRUCTION AND PARAMETERS

A one-dimensional MODFLOW-SURFACT model was constructed to simulate a one-dimensional soil column. The model domain consisted of one row and one column. Vertically, the model has thirty layers with a uniform thickness of 5 feet to represent the vadose zone and one layer with a thickness of 50 feet to represent the saturated zone. The groundwater table was assumed to be at 150 feet below ground surface (bgs).

The lithologic profile used in the MODFLOW-SURFACT model was based on the logs of on-site Borings 125 and 126; the lithologic profile developed from these two borings was considered representative of site-wide conditions. The hydrogeologic parameters and Van Genuchten's model parameters for each layer were obtained using the computer code ROSETTA (version 1.2) developed by the Salinity Laboratory of the United States Department of Agriculture (2000).<sup>7</sup> The inputs to the ROSETTA code are the percentage of sand, silt, and clay in each layer. For each boring, the percentages of gravel, sand, silt, and clay in 5-foot intervals between the ground surface and the groundwater table were estimated. The percentage of gravel is combined with the percentage of sand as the ROSETTA does not accept percentage of gravel as an input. The percentages in the same interval for the two borings were then averaged to obtain average percentages as input to ROSETTA. In the MODFLOW-SURFACT model for crushed concrete, the hydrogeologic parameters and Van Genuchten's model parameters for gravel were used for the top 15 feet of vadose soil to represent the crushed concrete as fill.

The other model parameters are listed below.

- Soil bulk density,  $\rho = 96$  pounds per cubic feet
- Porosity,  $n = 0.40$
- Soil organic carbon content,  $f_{oc} = 0.39\%$
- Sorption partition coefficient for PCBs,  $K_{oc} = 309,000$  liters per kilogram

Site-specific soil physical properties were based on the field investigations of the Morrison Knudsen Corporation (1995).<sup>8</sup> The effective porosity value in the model is assumed to be 40 percent, based on an average porosity value of 47 percent. The sorption partition

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<sup>6</sup> Environmental Simulation, Inc., 2007, Groundwater Vista (version 5.01), Reinholds, Pennsylvania, June.

<sup>7</sup> United States Salinity Laboratory, 2000, ROSETTA (version 2.1), Agricultural Research Service, United States Department of Agriculture, November.

<sup>8</sup> Morrison Knudsen Corporation, 1995, Final Report Stoddard Solvent System Field Investigation, Aluminum Company of America, October 27.



coefficient for PCBs was obtained from U.S. EPA guidance (1996).<sup>9</sup> The dispersivity in the model is assumed to be equal to 15 feet, 10 percent of the simulated distance between PCB source and groundwater table (150 feet).

Infiltration was applied to the uppermost model layer. Different infiltration rates were assumed for stress periods of 11 years or one year in length.<sup>10</sup> An average infiltration rate of four inches per year was assumed for each 11-year stress period, which is approximately 25 percent of the average annual precipitation at the Los Angeles Civic Center weather station (the nearest Western Regional Climate Center Station to the city of Vernon) from 1906 to 2010 (14.7 inches per year).<sup>11</sup> Four inches per year of infiltration is considered conservative for a largely paved or vegetated land surface. As a reference, if the infiltration rate is calculated using the recharge model of Williamson et al., 1989,<sup>12</sup>

$$R = \max[(0.64 \times P - 9.1), 0]$$

where, R = infiltration rate (inches/year)  
P = precipitation (inches/year)

the infiltration rate is approximately 0.4 inches per year. A study of infiltration rates in Riverside County, which has similar meteorological conditions as the site, by USGS, also suggested that the land surface infiltration rate is much less than 25% of precipitation.<sup>13</sup> Therefore, the infiltration rate of four inches per year is a conservative assumption, even for an unpaved land surface. For each one-year stress period, an infiltration rate of 8.5 inches per year was assumed, which is approximately 25 percent of the highest recorded annual precipitation from the Los Angeles Civic Center weather station from 1906 to 2010 (34.0 inches per year).<sup>11</sup>

A constant head boundary with the specified head equal to the elevation of the top of the bottom layer was applied at the bottom layer to represent the groundwater table elevation in the saturated zone.

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<sup>9</sup> U.S. EPA, 1996, Soil Screening Guidance: Users Guide and Technical Background Document, Office of Solid Waste and Emergency Response, Washington, D.C., EPA/540/R-95/128, May.

<sup>10</sup> The model was set up to run in transient mode for a 500-year period, divided into five 100-year cycles, with each cycle consisting of nine 11-year stress periods with average precipitation (divided into 132 monthly time steps) and one 1-year stress period with 100-year recurrence interval precipitation (divided into 12 monthly time steps).

<sup>11</sup> Western Regional Climate Center, <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5115>

<sup>12</sup> Williamson, A.K., D.E. Prudic, and L.A. Swain, 1989, Ground-water flow in the Central Valley, California, U.S. Geological Survey Professional Paper 1401-D.

<sup>13</sup> USGS, Rainfall-Runoff Characteristics and Effects of Increased Urban Density on Streamflow and Infiltration in Eastern Part of the San Jacinto River Basin, Riverside County, California, USGS Water-Resources Investigations Report 02-4090.

## 2.2 SIMULATIONS

Two separate simulations, one for PCBs in soil and another for PCBs in concrete (assumed to be crushed and re-used as fill on-site), were conducted to evaluate if the detected concentrations in either medium pose a threat to groundwater quality. Specifically, the simulations were used to estimate site-specific attenuation factors for PCBs, which were then used in reverse calculations from the groundwater MCL to calculate the total Aroclor concentrations that would be necessary in the vadose zone to pose a potential threat to groundwater.

### 2.2.1 PCBs in Soil

The MODFLOW-SURFACT model described above was used to estimate site-specific attenuation factors for PCBs in soil at hypothetical source depths of 15 feet, 30 feet, and 45 feet bgs. These attenuation factors were estimated by having the MODFLOW-SURFACT model simulate the movement of PCBs in pore water from these depths to pore water immediately above the water table (at approximately 150 feet bgs) after 500 years. A constant total Aroclor concentration in pore water of 100 micrograms per liter ( $\mu\text{g/L}$ ) was assumed at each source depth for the simulations. The attenuation factors were then calculated as the ratios of the source pore water concentration (100  $\mu\text{g/L}$ ) to the simulated pore water concentrations immediately above the water table. All calculations using the MODFLOW-SURFACT simulation results were implemented in Mathcad<sup>®</sup> (version 14; Parametric Technology Corporation, 2007) (Worksheet D-15).

For the hypothetical source depths of 15 and 30 feet bgs, the simulated pore water concentrations immediately above the water table were below the lowest value that the MODFLOW-SURFACT could report ( $1 \times 10^{-44}$   $\mu\text{g/L}$ ). The minimum reportable concentration ( $1 \times 10^{-44}$   $\mu\text{g/L}$ ) was therefore used as the simulated pore water concentration immediately above the water table in calculating the attenuation factors for these two cases. As the pore water concentrations immediately above the water table would actually be lower than this minimum reportable value, the simulated attenuation is actually higher than the results would indicate.

As presented in Worksheet D-15, the attenuation factors calculated using this method ranged from  $2.2 \times 10^{44}$  to  $1 \times 10^{46}$  for source depths of 15 to 45 feet bgs. These attenuation factors are conservative because the dilution of PCBs after entering the saturated zone and the degradation of PCBs in the vadose zone are not considered in the MODFLOW-SURFACT model. These attenuation factors were then used in a reverse calculation from the MCL, 0.5  $\mu\text{g/L}$ , to estimate the source pore water concentrations at 15 feet, 30 feet, and 45 feet bgs that would be necessary to pose a potential threat to groundwater quality. The estimated source pore water concentrations ranged from  $1.1 \times 10^{41}$  to  $5 \times 10^{42}$  milligrams per liter (mg/L)

(Worksheet D-15). Based on these calculations, the concentration of total Aroclors in source pore water at the Site would need to exceed  $1.1 \times 10^{41}$  mg/L at 45 feet bgs or  $5 \times 10^{42}$  mg/L at 15 to 30 feet bgs to result in groundwater concentrations exceeding the MCL. Because these concentrations greatly exceed the solubility limit of PCBs in water (0.7 mg/L; U.S. EPA, 1996) and exceeds the concentration of pure phase PCBs ( $1 \times 10^6$  mg/L), it is physically impossible to achieve total Aroclor concentrations in the source pore water that would result in a concentration of total Aroclors exceeding the MCL in groundwater. Therefore, PCBs in soil at the Site do not pose a potential threat to groundwater at the Site.

### **2.23.2 PCBs in Crushed Concrete**

Because crushed concrete containing PCBs may be re-used as on-site fill materials within the upper 15 feet of the vadose zone, the reverse calculation method described above was also used to verify that PCBs in re-used crushed concrete do not pose a potential threat to groundwater quality. The MODFLOW-SURFACT simulation was performed in the same manner as described above for soil, but modified to account for the physical properties associated with crushed concrete. For crushed concrete, the hydrogeologic parameters and Van Genuchten's model parameters for gravel (Fayer et al., 1992)<sup>14</sup> were used rather than the lithologic parameters estimated for the upper 15 feet of the soil column. An attenuation factor was then estimated for PCBs from a source depth of 15 feet bgs, corresponding to the bottom depth of proposed concrete re-use. As presented in Worksheet D-16, the attenuation factor estimated for the concrete re-use scenario was  $1 \times 10^{46}$ , equal to the attenuation factor estimated for PCBs in native soil at 15 or 30 feet bgs (Worksheet D-15). Correspondingly, the source pore water concentration of total Aroclors dissolved from crushed concrete at 15 feet bgs would need to exceed  $5 \times 10^{42}$  mg/L to result in groundwater concentrations exceeding the MCL. As noted earlier for soil, these concentrations greatly exceed the solubility limit of PCBs in water (0.7 mg/L; U.S. EPA, 1996) and exceed the concentration of pure phase PCBs ( $1 \times 10^6$  mg/L), and therefore it is physically impossible to achieve total Aroclor concentrations in the source pore water from the crushed concrete that would result in a concentration of total Aroclors exceeding the MCL in groundwater. Therefore, PCBs in concrete that may be re-used (on-site disposal) as on-site fill materials also do not pose a potential threat to groundwater at the Site.

### **2.2.3 Forward Simulation and Sensitivity Analysis**

As confirmation of the modeling results presented above, the PCB attenuation model was run using a forward simulation approach. The model was re-run using the modeling parameters noted above for PCBs in soil at depths of 15, 30 and 45 feet bgs (Figure 1). At all three

<sup>14</sup> Fayer, M. J., M. L. Rockhold, and M. D. Campbell, 1992, Hydrologic Modeling of Protective Barriers: Comparison of Field Data and Simulation Results, Soil Science Society of America Journal, 56: 690-700.

depths, the modeled PCB concentrations in soil were reduced to non-detect levels at a shallow depth regardless of the duration. A similar outcome was obtained for the modeled PCB concentrations in crushed concrete at a depth of 15 feet bgs (Figure 2).

Also, to address concerns regarding potential colloid-facilitated transport or cosolvency effects, sensitivity analysis simulations were performed where the retardation factor for PCBs was reduced by one order of magnitude (i.e., 10 percent of the value). The simulated concentration profiles over time for PCBs in soil at depths of 15, 30, and 45 feet bgs and crush concrete at a depth of 15 feet are shown on Figures 1 and 2. Although changing the retardation rate increased the migration rate of PCBs through the soil column, the resulting increased migration rate was not fast enough to cause an impact to groundwater.

Neither the forward simulation modeling results or the sensitivity analysis changed the conclusions presented above. Therefore, PCBs in soil that will remain in place below a depth of 15 feet bgs or in crushed concrete used for backfill that contains PCBs below the remediation goal (at concentrations between 1 mg/kg and 3.5 mg/kg) do not pose a potential threat to groundwater at the Site.

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### APPENDIXES

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## ACRONYMS AND ABBREVIATIONS

1,2-DCA	1,2-dichloroethane
Alcoa	Aluminum Company of America
AMEC	<u>AMEC Environmental &amp; Infrastructure, Inc., formerly AMEC Geomatrix, Inc.</u>
ASTM	ASTM International (formerly American Society for Testing and Materials)
BTEX	benzene, toluene, ethylbenzene, and total xylenes
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
cfu/gm-dw	bacteria colony forming units per gram of soil dry weight
<u>CPT/ROST</u>	<u>cone penetration test/rapid optical screening test</u>
COC	chemical of concern
COPC	chemical of potential concern
Cr (VI)	hexavalent chromium
DAF20	Dilution Attenuation Factor of 20
<u>1,2-DCA</u>	<u>1,2-dichloroethane</u>
<u>1,1-DCE</u>	<u>1,1- dichloroethene</u>
<u>DO</u>	<u>dissolved oxygen</u>
DTSC	Department of Toxic Substances Control
ESA	Environmental Site Assessment
FS	Feasibility Study
Geomatrix	Geomatrix Consultants, Inc., and AMEC Geomatrix, Inc.
H&EC	City of Vernon Health & Environmental Control
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HI	Hazard Index

## ACRONYMS AND ABBREVIATIONS (Continued)

HQ	Hazard Quotient
ISR	in situ respiration
ISS	in situ stabilization
MCL	Maximum Contaminant Level
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
<u>mg/kg/year</u>	<u>milligrams per kilogram per year</u>
MNA	monitored natural attenuation
NCP	National Contingency Plan
O&M	Operation and Maintenance
OEC	Other Environmental Condition
OEHHA	Office of Environmental Health Hazard Assessment
Order	Imminent and Substantial Endangerment Determination and Consent Order
<u>ORP</u>	<u>oxidation-reduction potential</u>
PCB	polychlorinated biphenyl
PCBNP	Polychlorinated Biphenyl Notification Plan
PCE	tetrachloroethene
Pechiney	Pechiney Cast Plate, Inc.
PID	photoionization detector
PPE	personal protective equipment
PRG	preliminary remediation goal
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
<u>QA/QC</u>	<u>Quality Assurance/Quality Control</u>
RAP	Remedial Action Plan
ROI	Radius of Influence

## ACRONYMS AND ABBREVIATIONS (Continued)

RBSL	Risk-Based Screening Level
REC	Recognized Environmental Condition
RWQCB	California Regional Water Quality Control Board, Los Angeles Region
SAP	Sampling and Analysis Plan
SCAQMD	South Coast Air Quality Management District
<u>SEC</u>	<u>specific electrical conductance</u>
Site	Former Pechiney Cast Plate, Inc. Facility, 3200 Fruitland Avenue, Vernon, California
SSL	Soil Screening Level
SVE	Soil Vapor Extraction
SVOC	semi-volatile organic compound
SWPPP	Storm Water Pollution Prevention Plan
TCE	trichloroethene
TEPH	total extractable petroleum hydrocarbons
TMB	trimethylbenzene
TPH	total petroleum hydrocarbons
<u>1,1,1-TCA</u>	<u>1,1,1-trichloroethane</u>
TSCA	Toxic Substances Control Act
TVPH	total volatile petroleum hydrocarbons
U.S. EPA	United States Environmental Protection Agency
UST	Underground Storage Tank
vGAC	vapor-phase Granular Activated Carbon
Vernon Facility	Former Pechiney Cast Plate, Inc. Facility, 3200 Fruitland Avenue, Vernon, California
VOC	volatile organic compound

**REMEDIAL ACTION PLAN**  
Former Pechiney Cast Plate, Inc. Facility  
3200 Fruitland Avenue  
Vernon, California

**EXECUTIVE SUMMARY**

AMEC Environmental & Infrastructure (AMEC; formerly Geomatrix, Inc. and AMEC Geomatrix Inc. (AMEG)), has prepared this Remedial Action Plan (RAP) on behalf of Pechiney Cast Plate, Inc. (Pechiney), for the former Pechiney facility (Vernon Facility or Site) located at 3200 Fruitland Avenue in Vernon, California (Figure 1).

**Introduction and Purpose**

Based on the information provided in the Feasibility Study (FS) (AMEC, 2012a), this RAP was prepared in accordance with Department of Toxic Substances Control (DTSC) guidance and policy for RAP development (DTSC policy #EO-95-007-PP), and pursuant to Health and Safety Code section 25356.1. This RAP provides the details and procedures for remediating polychlorinated biphenyl (PCB)-impacted concrete during demolition of below-grade features, and remediating impacted soil and soil vapor during and following below-grade demolition. On July 6, 2010, DTSC issued an Imminent and Substantial Endangerment Determination and Consent Order (Order) (DTSC, 2010) for the Site. DTSC has the final approval authority for the implementation of this site-wide RAP. However, pursuant to the Code of Federal Regulations (CFR), Title 40, Subchapter R, Toxic Substances Control Act, Part 761 (40 CFR 761), the United States Environmental Protection Agency (U.S. EPA) has approval authority for risk-based remediation of PCB releases and disposal of PCB remediation waste (soil and concrete). Pechiney will implement the RAP pursuant to the Order, and subject to DTSC's approval of the RAP and U.S. EPA approval of the PCB risk-based application referred to as the Polychlorinated Biphenyls Notification Plan (PCBNP) (AMEC, 2009) for the Site. On July 2, 2010, U.S. EPA issued a conditional approval letter regarding the PCBNP, which outlined requirements for additional PCB sampling and submission of additional information. In the conditional approval letter, U.S. EPA also deferred the approval of the PCB remediation goals until the additional PCB sampling results and information was submitted to U.S. EPA. The results of the additional sampling were submitted to U.S. EPA for review on December 29, 2010. U.S. EPA's conditional approval of the PCB remediation goals was granted on July 1, 2011.

This RAP was revised to address additional comments made by DTSC to the September 2009 draft RAP, and additional requirements imposed by U.S. EPA regarding PCBs.

## Site History

The Site is comprised of approximately 26.9 acres and was formerly occupied by approximately 600,000 square feet of building area. Manufacturing operations at the Site began in approximately 1937 and included production of high-precision cast aluminum plates. As part of their manufacturing operations, Aluminum Company of America (Alcoa; original Site owner) used fuels and Stoddard solvent, both of which were stored in underground storage tanks. Stoddard solvent was used during the aluminum manufacturing process. Alcoa also operated processes that required lubricating and hydraulic oils and generated hazardous waste that was stored at various locations throughout the Site.

In 1998, Alcoa sold the western portion of the facility (3200 Fruitland Avenue) to Century Aluminum Company. In 1999, Pechiney purchased the Site, and subsequently closed the Vernon facility in late 2005 January 2006.

## Previous Investigations, Chemicals of Concern, and Removal Actions

Previous remedial investigations were conducted at the Site for soil, soil vapor, groundwater, and building materials. During these investigations, chemicals of concern (COCs) were identified at the Site as described below.

- Soil impacted with petroleum hydrocarbons (including Stoddard solvent compounds), metals, PCBs, and volatile organic compounds (VOCs).
- Soil vapor impacted with Stoddard solvent compounds and VOCs.
- Groundwater (at a depth of 150 feet) impacted with chlorinated VOCs.
- Building concrete slabs impacted with PCBs.

Prior to 1999, Alcoa investigated subsurface conditions and conducted limited remediation in both the eastern and western portions of its facility as part of their efforts to seek closure of its City of Vernon Health & Environmental Control hazardous materials permit. Alcoa's activities are described in Section 3.0 of this document.

As part of the aboveground demolition work completed in November 2006 by Pechiney, the above-ground features, including the former manufacturing facilities, were demolished leaving the concrete floor slab in place; and the debris was transported off site for disposal or recycling.

## Summary of Site Risks

The preferred remedial alternatives discussed in this RAP focus on mitigating principal risk threats posed by remaining PCB-impacted concrete, surface and shallow COC-impacted soil, deeper soil impacted by Stoddard solvent, and deeper soil impacted by VOCs.

Implementation of the RAP will reduce the potential for risks to human health due to exposure to shallow soil containing COCs, and reduce the potential impacts to groundwater from exposure to deeper COC-impacted soil.

The RAP also provides materials management practices that will be implemented during below-grade demolition, and handling ~~excavation and removal~~ of non-COC-impacted concrete and soil at the Site.

## Remedy Evaluation Process

The Health and Safety Code section 25356.1(d) requires that remedy evaluations be based on requirements contained in the National Contingency Plan (NCP), 40 CFR 300.430. The NCP identifies evaluation criteria (also known as balancing or evaluation criteria) to be used in the development and scoping of remedial alternatives to provide a basis for comparison using additional, more detailed criteria, referred to as evaluation criteria. The criteria include those developed by the U.S. EPA in NCP 40 CFR 300.430(a)(1)(iii) and as modified by the State of California. All nine balancing criteria (including Threshold Criteria, Primary Balancing Criteria, and Modifying Criteria) are evaluated in the FS and described in this RAP.

The following technologies were previously evaluated in the FS and retained for additional detailed evaluation.

- No action.
- Excavation and removal followed by landfill disposal for surface and shallow COC-impacted soil and deep VOC-impacted soil.
- In situ stabilization of shallow metals-impacted soil, Stoddard solvent-impacted soil, and PCB-impacted soil.
- Soil vapor extraction (SVE) for shallow and deep VOC-impacted soil.
- SVE and bioventing for shallow and deep Stoddard solvent-impacted soil.
- Demolition and off-site disposal of PCB-impacted concrete.

These technologies were combined in the FS into potential alternatives considered for mitigating COC-impacted areas at the Site, which are discussed further in Section 6.2 of this document.

## Alternatives Considered

The alternatives evaluated in the FS are presented below.

### *Alternative 1*

Alternative 1 defined as “No Action” is included for evaluation pursuant to NCP 40 CFR 300.430(e)(6) and retained for comparison purposes. In this alternative, no below-grade demolition or soil remediation would be performed. Based on the findings described in the FS, a “No Action” alternative is not acceptable for this Site.

### *Alternative 2*

Alternative 2 consists of excavation and off-site disposal of both shallow and deep COC-impacted soil (metals, PCBs, Stoddard solvent, and VOCs) to depths of approximately 8 feet below ground surface (bgs) for metals, 12 feet bgs for PCBs, and 45 to 50 feet bgs for VOCs and Stoddard solvent, respectively. Excavation will require installation of shoring for sidewall stability and safety during soil removal. Vadose zone VOC remediation will promote a reduction in VOC concentrations in groundwater beneath the northern portion of the Site.

This alternative also consists of demolition and landfill disposal of PCB-impacted concrete slabs containing PCB concentrations greater than 3.5 milligrams per kilogram (mg/kg). In addition, PCB-impacted concrete (greater than 1.0 mg/kg and less than 3.5 mg/kg) would be crushed and deposited on site as restricted fill material (i.e., on site disposal) and covered with an interim cap consisting of a visual identifier layer and a minimum of 12 inches of clean, crushed concrete (unrestricted fill material). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on site as unrestricted fill material. A land use covenant that incorporates an operation and maintenance (O&M) plan and soil management plan would also be included in this alternative.

### *Alternative 3*

Alternative 3 consists of excavation and off-site disposal of shallow COC-impacted soil (PCBs and metals) to depths of approximately 15 feet bgs. Shallow (up to 50 feet bgs) and deep (up to 90 feet bgs) VOC-impacted soil would be mitigated using SVE. Shallow (up to 50 feet bgs) Stoddard solvent-impacted soil would be mitigated using sequential treatment consisting initially of SVE, followed by longer term bioventing. Vadose zone VOC remediation will promote a reduction in VOC concentrations in groundwater beneath the northern portion of the Site. Deeper soils (at depths greater than 15 feet) impacted with PCBs above the remediation goal would be left in place and covered with a physical barrier at depth. The physical barrier would consist of 6 inches of cement concrete. This alternative also consists of demolition and landfill disposal of PCB-impacted concrete slabs containing PCB concentrations greater than 3.5 mg/kg. In addition, PCB-impacted concrete (greater than 1.0 mg/kg and less than 3.5 mg/kg) would be crushed and deposited on site as restricted fill material (i.e., on-site disposal)



and covered with an interim cap consisting of a visual identifier layer and a minimum of 12 inches of clean, crushed concrete (unrestricted fill material). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on site as unrestricted fill material. A land use covenant that incorporates an O&M plan and soil management plan would also be included in this alternative.

#### *Alternative 4*

Alternative 4 consists of in situ stabilization of shallow PCB- and metals-impacted soil and deep Stoddard solvent-impacted soil, using a cement-based additive to depths of approximately 15 feet bgs for PCB- and metals-impacted soil and approximately 50 feet for Stoddard solvent-impacted soil. Shallow (up to 50 feet bgs) and deep (up to 90 feet bgs) VOC-impacted soil would be mitigated using SVE. Vadose zone VOC remediation will promote a reduction in VOC concentrations in groundwater beneath the northern portion of the Site. This alternative also consists of demolition and landfill disposal of PCB-impacted concrete slabs containing PCB concentrations greater than 3.5 mg/kg. PCB-impacted concrete (greater than 1.0 mg/kg and less than 3.5 mg/kg) would be crushed and deposited on site as restricted fill material (i.e., on-site disposal) and covered with an interim cap consisting of a visual identifier layer and a minimum of 12 inches of clean, crushed concrete (unrestricted fill material). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on site as unrestricted fill material. A land use covenant that incorporates an O&M plan and soil management plan would also be included in this alternative.

#### **Preferred Remedial Alternative**

Alternative 3 was selected as the preferred remedial alternative because Alternative 3 meets the balancing criteria discussed above, as required by Health and Safety Code Section 25356.1(d) and the NCP, and will not require extensive soil excavation and off-site disposal, and COC-impacted soil will be mitigated to reduce COC concentrations to levels below risk-based remediation goals. Alternative 3 is preferred over Alternative 2 because Alternative 3 provides a reduction of toxicity, mobility, and volume of COC-impacted soil by treatment compared to landfill disposal. Alternative 3 is preferred over Alternative 4 because Alternative 3 will reduce the toxicity, mobility, and volume of COC-impacted soil to a greater extent than Alternative 4. Alternative 3 consists of limited soil excavation and disposal and SVE and bioventing in a balanced mitigation strategy that is cost-effective, minimally invasive, less disruptive to the local community, and protective of human health and the environment. The preferred alternative also includes a land use covenant that incorporates an O&M plan and a soil management plan.

## Community Involvement

The objective of the community involvement program is to inform the community of the progress of demolition and remediation work and to effectively respond to health, environment, and safety concerns and questions. The community involvement program will be consistent with the Comprehensive Environmental Response, Compensation and Liability Act as implemented by the NCP 40 CFR 300.430(c)(1). The purpose of the community involvement plan as stated by the NCP 40 CFR 300.430(c)(2)(ii)(A), is to “ensure the public appropriate opportunities for involvement in a wide variety of Site-related decisions, including Site analysis and characterization, alternatives analysis, and selection of remedy; and to determine, based on community interviews, appropriate activities to ensure such public involvement.”

Objectives of the community involvement program include:

- soliciting input from the community on concerns regarding the remedial activities;
- establishing effective communication between the community, Pechiney, and DTSC;
- informing the community about progress of the remedial activities; and
- providing opportunities for the community to participate and comment on the proposed remedial activities.

Prior to implementation of the RAP, DTSC will expand its outreach and distribute an information fact sheet to businesses and residents surrounding the Site and to other interested stakeholders. This fact sheet will include information about the Site, remedial activities, and project contacts. Additionally, a local information repository will be established to make documents and other information available to the public and a Site mailing list will be developed.

This RAP will be made available to the public for a comment period of at least 30 days. DTSC will respond to any comments received during the public comment period and will provide a timely opportunity for the public to access documents.

Depending on the level of community response and level of interest, DTSC may hold a community meeting to discuss the components of the RAP, the Site's history, and proposed remedial work. The meeting may also provide the opportunity for the public to submit comments regarding the RAP. DTSC will work with the community to develop a meeting format that suits the community's needs.

**REMEDIAL ACTION PLAN**  
Former Pechiney Cast Plate, Inc. Facility  
3200 Fruitland Avenue  
Vernon, California

## 1.0 REMEDIAL ACTION PLAN

AMEC Environmental & Infrastructure, Inc. (formerly AMEC Geomatrix, Inc. [(AMEC)]), has prepared this Remedial Action Plan (RAP) on behalf of Pechiney Cast Plate, Inc. (Pechiney) for the former Pechiney facility (Vernon Facility or Site) located at 3200 Fruitland Avenue in Vernon, California (Figure 1).

A Feasibility Study (FS) (AMEC, 2012<sup>4a</sup>) has been prepared on behalf of Pechiney, to evaluate potential remedial technologies and provide recommendations for the proposed, preferred remedy for impacted soil and soil vapor within the vadose zone, and impacted concrete at the Site. The FS was submitted to the Department of Toxic Substances Control (DTSC). The FS was completed using the Code of Federal Regulations (CFR), Title 40, Section 300, also known as the National Contingency Plan (NCP), and appropriate guidance documents developed by the United States Environmental Protection Agency (U.S. EPA), including the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation/Feasibility Study guidance (U.S. EPA, 1988).

This RAP was prepared in accordance with DTSC guidance and policy for RAP development (DTSC policy #EO-95-007-PP), and pursuant to California Health and Safety Code Section 25356.1. This RAP provides the details and procedures for remediating polychlorinated biphenyl (PCB)-impacted concrete during demolition of below-grade features, and remediating impacted soil and soil vapor during and following below-grade demolition. On July 6, 2010, DTSC issued an Imminent and Substantial Endangerment Determination and Consent Order (Order) (DTSC, 2010) for the Site. DTSC has the final approval authority for the implementation of this site-wide RAP. However, pursuant to CFR, Title 40, Subchapter R, Toxic Substances Control Act (TSCA), Part 761 (40 CFR 761), the U.S. EPA has approval authority for risk-based remediation of PCB releases and disposal of PCB remediation waste (soil and concrete). Pechiney will implement the RAP pursuant to the Order, and subject to DTSC's approval of the RAP and U.S. EPA approval of the PCB risk-based application referred to as the Polychlorinated Biphenyls Notification Plan (PCBNP) (AMEC, 2009) for the Site. On July 2, 2010, U.S. EPA issued a conditional approval letter regarding the PCBNP, which outlined requirements for additional PCB sampling and submission of additional information. In the conditional approval letter, U.S. EPA also deferred the approval of the PCB remediation goals until the additional PCB sampling results and information was submitted to

U.S. EPA for review, which was submitted to U.S. EPA on December 29, 2010. U.S. EPA's conditional approval of the PCB remediation goals was obtained on July 1, 2011.

## 1.1 INTRODUCTION

The Site is comprised of approximately 26.9 acres (including Assessor Parcel Numbers 6301-008-010, -011, -012, -013, which was divided into Parcels 6, 7, and 8) and was formerly occupied by approximately 600,000 square feet of building area. The Site was used to manufacture high-precision cast aluminum plates. As part of the demolition work completed in November 2006, the above-ground features, including the former manufacturing facilities, were demolished; leaving the concrete floor slabs in place, and the debris was transported off site for disposal or recycling.

Remediation of remaining impacted concrete and soil will be conducted in conjunction with demolition of remaining surface slabs and below-grade features. This work will include removal of man-made structures, building slabs, pavements, footings, foundations, pits, and sumps located within the footprint of the former buildings as described in the Below Grade Demolition Plan (Geomatrix Consultants Inc. [Geomatrix], 2006a, revised November 27, 2011, AMEC) previously approved by the City of Vernon.

## 1.2 REPORT STRUCTURE

This RAP includes the following information (listed by relevant section).

- Section 1.0 provides an introduction to the RAP and defines the report structure.
- Section 2.0 provides Site background information.
- Section 3.0 summarizes the results of the remedial investigation.
- Section 4.0 describes the removal actions completed to date.
- Section 5.0 presents a summary of Site risks.
- Section 6.0 provides a summary evaluation of the remedial alternatives considered in the FS.
- Section 7.0 discusses implementation of the preferred remedial alternative, and provides additional details related to soil management of any new, undiscovered releases that might be encountered during below-grade demolition or RAP implementation.
- Section 8.0 discusses the public participation and community involvement process.
- Section 9.0 provides report references.

## 2.0 SITE BACKGROUND

Aluminum Company of America's (Alcoa's) manufacturing operations reportedly began at the Site in approximately 1937 and included production of high-precision cast aluminum plates. As part of their manufacturing operations, Alcoa (original Site owner) used fuels and Stoddard solvent, both of which were stored in underground storage tanks (USTs). Alcoa used Stoddard solvent during the aluminum manufacturing process. Alcoa also operated processes that required lubricating and hydraulic oils and generated hazardous waste that was stored at various locations throughout the Site. The historical site layout is shown on Figure 2.

Previous investigations were conducted at the Site for soil, groundwater, soil vapor, and building materials. During these investigations, soil impacted with petroleum hydrocarbons (including Stoddard solvent), metals, PCBs, and volatile organic compounds (VOCs) were identified. The presence of chlorinated VOCs also was identified in groundwater at a depth of approximately 150 feet below ground surface (bgs) within the southwestern portion of Parcel 7, west of Building 112A and within the northern portion of the Buildings 106/108 on Parcel 8.

In approximately 1997, Alcoa sold the eastern half of its facility, which subsequently was razed, subdivided, and redeveloped for industrial and commercial uses. Prior to 1999, Alcoa investigated subsurface conditions and conducted limited remediation in both the eastern and western portions of its facility as part of its efforts to close its City of Vernon Health and Environmental Control (H&EC) hazardous materials permit. These activities are described in Section 3. In December 1998, Alcoa sold the western portion of the facility (3200 Fruitland Avenue) to Century Aluminum Company. In 1999, Pechiney purchased the Site, and subsequently closed the Vernon facility in January 2006.

This preferred remedial alternative discussed in this RAP addresses principal risk threats posed by chemicals of concern (COCs) present at the Site. These principal risks include PCB-impacted concrete, surface and shallow COC-impacted soil (at depths less than or equal to 15 feet), deep Stoddard solvent-impacted soil (at depths greater than 15 feet), and deep VOC-impacted soil at the Site. RAP implementation will reduce the potential for risks to human health due to exposure to shallow soil containing COCs, and remediation of deeper COC-impacted soil that may potentially affect groundwater quality.

The RAP also covers the materials management practices that will be implemented during below-grade demolition, and ~~excavation and removal~~ handling of non-COC-impacted concrete and soil at the Site.

### 3.0 SUMMARY OF REMEDIAL INVESTIGATIONS

Previous remedial investigations performed by prior Site owners and Pechiney are summarized below.

#### 3.1 ALCOA'S PREVIOUS INVESTIGATIONS

Previous investigations were conducted by consultants to Alcoa and were related to closure of Alcoa's facilities and operations on and east of the Site (including Alcoa's efforts to seek closure of its City of Vernon H&EC hazardous materials permit). A summary of previous Alcoa investigations is presented in the Phase I Environmental Site Assessment (ESA) (Geomatrix, 2005a) and the FS (AMEC, 2011a/2012a). These previous investigations included the collection and analysis of soil, groundwater, soil vapor, and building materials samples, and were conducted under the oversight of the City of Vernon H&EC. During these investigations, soil impacted with petroleum hydrocarbons (including Stoddard solvent), metals, PCBs, and VOCs were identified. The presence of chlorinated VOCs (trichloroethene [TCE], 1,2-dichloroethane [1,2-DCA], and chloroform) also was identified in groundwater at a depth of approximately 150 feet bgs within the southwestern portion of Parcel 7, west of Building 112A.

Nine groundwater wells were constructed at the Site between 1990 and 1991 by Alcoa under the oversight of the City of Vernon H&EC. All but three of the monitoring wells (AOW-6, AOW-8, and AOW-9; Figure 2) were destroyed by Alcoa under the oversight of the City of Vernon H&EC. The three remaining groundwater monitoring wells are located near former Building 112A in the southern portion of Parcel 7. Groundwater quality data collected from monitoring wells sampled and analyzed between 1990 and 1997 indicated the presence of TCE, 1,2-DCA, and chloroform in groundwater (upper portion of the Exposition aquifer) beneath the southwest portion of the Site with historical concentrations of 160 micrograms per liter ( $\mu\text{g/L}$ ), 370  $\mu\text{g/L}$ , and 105  $\mu\text{g/L}$ , respectively, of TCE, 1,2-DCA and chloroform (Enviro-Wise, 1998). The highest concentrations of these VOCs were detected in groundwater in the vicinity of the former Stoddard solvent USTs located outside of Building 112A in Parcel 7.

Previous evaluations conducted by Alcoa suggested the source of VOCs in groundwater in the southwest portion of Parcel 7 was from an upgradient, off-site source. At the time, the City of Vernon H&EC concurred with this evaluation, but because the closure of the groundwater wells required the California Regional Water Quality Control Board, Los Angeles Region (RWQCB) concurrence and approval, Alcoa submitted its recommendations for Site closure to the RWQCB on February 18, 1999 (Alcoa, 1999). Because groundwater at these wells was impacted with chlorinated VOCs and because the wells were located in an area associated with the former Stoddard solvent USTs, the RWQCB required that Alcoa perform additional analysis of groundwater for methyl tertiary-butyl ether and fuel oxygenates (RWQCB, 2002). Alcoa conducted additional monitoring of the remaining three groundwater wells in 2005 and

2006 and submitted the monitoring data to the RWQCB. Based on the monitoring results, the concentrations of chlorinated VOCs decreased relative to the concentrations reported earlier (1990-1997). The compounds TCE, 1,2-DCA, and chloroform were detected at concentrations up to 28 µg/L, 6.1 µg/L, and 8.6 µg/L, respectively, during the most recent sampling event conducted in 2006 (URS Corporation, 2006). These compounds were not detected in groundwater samples collected from well AOW-6.

In a March 28, 2008 letter, the RWQCB directed Alcoa to 1) provide a work plan to characterize residual soil contamination in the former Stoddard solvent UST area and submit a site-specific health and safety plan by April 25, 2008; 2) sample the groundwater wells in the former UST area (AOW-7, AOW-8 and AOW-9) or install and sample replacement groundwater wells if AOW-7, AOW-8 and AOW-9 cannot be used or located; 3) submit additional historical reports and data related to the Stoddard solvent releases; 4) analyze soil and groundwater for a specific suite of petroleum hydrocarbon compounds and VOCs; 5) log and sample soil at 5-foot intervals, at lithologic changes, or observed impacted soil; and 6) initiate electronic submittals through the State database (RWQCB, 2008a).

On December 18, 2008, the RWQCB (2008b) determined that the impacts associated with chlorinated solvents in soil and groundwater at the Site, including the area of the former Stoddard solvent USTs, should be addressed under the jurisdiction of the DTSC. On January 16, 2009, the RWQCB confirmed completion of Alcoa's site investigation and corrective actions to address soil impacts related to eight former USTs containing gasoline, diesel/No. 2 fuel oil, and waste oil. The RWQCB specially excluded "subsequent investigations and/or remediation of the residual contamination associated with chlorinated solvents in soil and groundwater for the entire site, including the area [formerly] containing four Stoddard solvent USTs." In addition, RWQCB closure documentation specifically excluded the closure of the four Stoddard solvent USTs (referred to as USTs T-9 through T-12). The RWQCB deferred these remaining issues to the DTSC's oversight. Although the Stoddard solvent impacts remain the responsibility of Alcoa, as directed by September 2, 1999 and July 18, 2006 letters from the City of Vernon H&EC, and a January 16, 2009, letter from the RWQCB, Alcoa has not taken responsibility for these impacts. Pursuant to the DTSC Order and the above actions, the Stoddard solvent-impacts and associated residual petroleum hydrocarbon-impacts have been included in this RAP.

### **3.2 GEOMATRIX INVESTIGATIONS**

In June 2005, Geomatrix conducted a Phase I ESA (Geomatrix, 2005a) at the Vernon Facility to identify Recognized Environmental Conditions (RECs) as defined by ASTM International, Inc. E1527-00 for Phase I ESAs. In addition to identifying RECs, Geomatrix identified historical RECs and the potential of other environmental conditions (OECs) at the Site. The

Phase I ESA report was submitted to the City of Vernon on September 1, 2005, and the City of Vernon H&EC concurred with the findings in their letter dated September 26, 2005. The findings of the Phase I ESA indicated the need for additional subsurface investigation work at the Site. Geomatrix submitted a Phase II ESA work plan (Geomatrix, 2005b) to the City of Vernon H&EC on September 2, 2005, and the work plan was approved by the City of Vernon H&EC on September 26, 2005 (City of Vernon, 2005). A summary of the Geomatrix investigations is described in the following subsections.

### **3.2.1 Phase II Investigation**

Based on the findings of the previous investigations and the manufacturing operations in each building and/or area, these chemicals of potential concern (COPCs) were identified:

- total petroleum hydrocarbons (TPH), including Stoddard solvent compounds;
- PCBs (as total Aroclors);
- VOCs;
- metals, including hexavalent chromium [Cr (VI)]; and
- semi-volatile organic compounds (SVOCs).

Based on Alcoa's historical groundwater monitoring results, TCE; 1,2-DCA; and chloroform were identified as groundwater COPCs at the Site.

A Phase II investigation was conducted as the initial remedial investigation at the Site between November and December 2005. The investigation was conducted to evaluate whether the RECs or OECs identified in the Phase I ESA had resulted in releases to the subsurface soil and/or groundwater at the Site. The initial remedial investigation included the collection and analysis of concrete, soil vapor, and soil samples for a number of constituents. The findings of the investigation were submitted to the City of Vernon H&EC in a report dated March 9, 2006 (Geomatrix, 2006b).

Soil and soil vapor data collected during the Phase II investigation were evaluated using a stepped screening process to evaluate the potential for groundwater impacts and the potential for risks to human health due to exposure to shallow soil containing COPCs. The initial step of the screening process was used to evaluate potential VOC impacts and the need to collect additional soil samples. Based on the soil vapor results obtained in Building 106, the collection and analysis of additional soil samples were required to further assess potential VOC impacts.



The second step of the screening evaluation included a comparison of the Phase II soil sample results to the following prescriptive regulatory screening levels.

- Los Angeles RWQCB Interim Site Assessment and Cleanup Guidebook (May 1996, and updated March 2004) groundwater protection screening levels for carbon range-specific petroleum hydrocarbons and aromatic hydrocarbons (benzene, toluene, ethylbenzene, and total xylenes [BTEX] compounds) in soil. The selected screening levels were obtained from Table 4-1 of the above-referenced RWQCB guidance assuming a sand lithology and a depth to groundwater of 150 feet.
- U.S. EPA Region IX Preliminary Remediation Goals (PRGs) for industrial sites and concentrations for VOCs, SVOCs, PCBs, and metals in soil (U.S. EPA, 2004).
- U.S. EPA Region IX soil screening levels (SSLs) for the protection of groundwater using a default dilution attenuation factor of 20 (DAF20) for VOCs, SVOCs, and metals, where available (U.S. EPA, 2004).
- California Background Concentrations of Trace and Major Elements in California Soil (Bradford, et al., 1996).
- California Code of Regulations, Title 22, Total Threshold Limit Concentration and Soluble Threshold Limit Concentration for metals and PCBs in building materials (waste characterization).

Based on the data collected during the Phase II investigation and the above screening evaluation process, certain areas at the Site were identified as impacted by one or more COPCs at concentrations greater than the screening criteria. Although the screening criteria are not intended to be remediation goals, they were used to evaluate the potential need for further action (such as additional investigation, analysis, or potential remediation).

Remediation goals may differ from screening levels based on site-specific considerations (e.g., redevelopment, future land use, potential exposure pathways, etc.), regulatory requirements, evaluation of risk, or other relevant factors as set forth in NCP 40 CFR 300.

The following areas of the Site had COPCs that exceeded one or more of the screening criteria (the boring locations discussed below are shown on Figure 3). For each of these areas, the results of the Phase II investigation indicated that additional investigation was required and the City H&EC approved these subsequent investigatory actions on March 20, 2006.

- Building 104 – PCBs were detected in the concrete slab and soil to a depth of 3 feet bgs adjacent to the location of a saw (borings 41, 73, and 74). Additional soil borings were required in the vicinity of the saw to assess the source and extent of PCBs detected in concrete and the underlying soil.
- Building 104 – PCBs were detected in soil to a depth of approximately 71.5 feet bgs in the vicinity of a vertical pit and a former vertical pit (boring 40). Additional soil

borings were required near both vertical pits to assess the source and extent of PCBs detected in soil.

- Buildings 106 and 108 – TCE was detected in soil beneath the northern portion of the buildings to a depth of approximately 48 feet bgs (boring 14), and TCE was detected in soil vapor. Additional investigation of the lateral extent of TCE in soil and its potential impacts to groundwater was required in this area.
- Building 112 (former etch station) and near storm water outfall #6 – one or more metals were detected in soil to a depth of 6 feet bgs (boring 113). Additional investigation of the lateral extent of metals in shallow soil was required in these areas.
- Former Substation #8 – PCBs were detected in the soil and gravel drainage area of the former substation to a depth of 2.2 feet bgs (boring 39), but PCBs were not detected in the soil boring adjacent to the drainage area. Additional investigation of the depth of the soil and gravel drainage area and the concentrations of PCBs in these materials was required.

Although concentrations of COPCs in other areas of the Site did not exceed screening criteria, additional remedial investigations were required by the City of Vernon H&EC at three locations to obtain a better understanding of the source of the deeper soil impacts and to confirm that soil concentrations were not increasing with depth. These three locations are listed below.

- Building 106 – Stoddard solvent-range petroleum hydrocarbons were detected in one soil sample at a depth of approximately 46.5 feet bgs (boring 13). Because these hydrocarbon compounds were not detected in shallow soil at this boring or in soil vapor in the vicinity of the boring, further investigation of the source of these compounds at 46.5 feet bgs in soil was required.
- Building 112 – TPH concentrations in soil increased with depth at a boring drilled to a depth of 9.6 feet adjacent to a former sump (boring 30). Although the hydrocarbon concentrations were below the screening levels, their vertical extent in soil adjacent to the sump had not been characterized and required further evaluation.
- Cooling Tower area – Cr (VI) and PCBs (Aroclor-1248) were detected in one soil sample from boring 46 at a depth of 21.1 feet bgs (the bottom of the boring). PCBs and Cr (VI) were not detected in shallow soil samples collected from boring 46, and therefore, further investigation of the source of PCBs and Cr (VI) detected at 21.1 feet bgs in soil was required.

### 3.2.2 Supplemental Phase II Investigations

The Phase II remedial investigation results indicated a need to 1) assess the extent of impacted soil exceeding the screening criteria, 2) assess potential impacts to groundwater, and 3) further understand the subsurface conditions at the Site for each of the areas identified in Section 3.2.1. Therefore, a Supplemental Phase II investigation was required in specific

areas of the Site to further characterize the extent of impacted soil and/or existing subsurface conditions for the reasons described above in Section 3.2.1. On March 9, 2006, Geomatrix submitted a proposed plan to the City of Vernon H&EC to further characterize the extent and potential significance of COPCs exceeding screening criteria in soil at the Site and the potential impacts to groundwater related to TCE detections in soil and soil vapor in Buildings 106 and 108. On March 20, 2006, the City of Vernon H&EC approved the Supplemental Phase II investigation plan, and the investigation was conducted between March 28, 2006, and April 24, 2006.

Based on the findings of the initial Supplemental Phase II investigation, a follow-up investigation was required to further characterize the extent of VOCs detected in soil, soil vapor, and groundwater in the north portion of the Site. In a letter to the City of Vernon H&EC dated May 9, 2006, Geomatrix identified additional sampling points in Buildings 106, 108, and 112. Under approval and direction from the City of Vernon H&EC, the additional investigation work began on May 11, 2006, and was completed on May 24, 2006. The findings of the Supplemental Phase II investigation were submitted to the City of Vernon H&EC in a report dated December 19, 2006 (Geomatrix, 2006c).

Soil data collected during the Supplemental Phase II investigation were evaluated using the stepped screening process discussed in Section 3.2.1, and sample locations where COPCs were detected above the screening levels are described in Section 3.5.

### **3.2.3 Geomatrix Concrete Characterization for PCBs as Aroclors**

In addition to the concrete testing conducted during the Phase II investigation, coring and testing of the concrete slabs and concrete transformer pads were performed during and after above-grade demolition work to further characterize PCB-impacted concrete. PCBs were detected in concrete samples at "total Aroclor" concentrations (the sum of detected Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260) greater than 1 milligram per kilogram (mg/kg) in portions of Buildings 104, 106, 108, 110, 112, and 112A. A summary of PCBs as total Aroclor concentrations for the concrete samples is depicted on Figure 4. The results for all tested Aroclors (Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260) are provided in Appendix A of the FS (AMEC, 2012a).

### **3.3 AMEC SUPPLEMENTAL SOIL VAPOR TESTING**

As a continuation of the remedial investigation work at the Site, Pechiney was directed by DTSC to conduct an off-site soil vapor survey at the intersection of Fruitland and Boyle Avenues near the northwest corner of the Site in July of 2009. DTSC required the work to assess the off-site extent of VOC concentrations in shallow soil vapor in the vicinity of former Building 106. In addition, and in order to meet DTSC's requirements for evaluating human

health risk related to vapor intrusion, a shallow soil vapor survey was conducted within the footprint of Building 112A and to the west of the building in the vicinity of the former Stoddard solvent UST area. This work was required due to the lack of soil vapor data. The soil vapor survey was conducted to complete the human health risk assessment (HHRA) for potential indoor air exposure to Stoddard solvent and associated compounds. The findings of this work are provided in the FS and tabulated analytical results are included in Appendix A of the FS (AMEC, 2012<sup>1</sup>a). The results of the testing are discussed in Section 3.5. Sample locations are shown on Figure 3. Based on the off-site soil vapor testing conducted in July 2009, the sample results indicated the following:

- TCE and tetrachloroethene (PCE) were detected in all shallow soil vapor samples (locations 161 through 164) at depths of 5 and 15 feet. Other VOCs, 1,1,1-trichloroethane (1,1,1-TCA; location 163 at 15 feet) and 1,1-dichloroethene (1,1-DCE at sample location #164 at 15 feet) were detected in only one sample each. No other VOCs were detected.
- TCE soil vapor concentrations decreased to the north, northwest (with the exception of the 15-foot sample at 164), and west of the Site, while the PCE soil vapor concentrations increased. TCE and PCE soil vapor concentrations also increased with depth. Assuming the suspected on-site source area for the site-derived TCE is present in the northwest corner of the Site, a threefold decrease in the concentration of TCE in soil vapor was measured between the on-Site sample location 81 and the off-site sample location 162, approximately 60 feet north. This reduction in concentration was also observed to the west between on-Site sample location 82 and off-site sample location 164. Based on this observation, the site-derived VOCs will continue to decrease at further distances from the Site and co-mingle with other potential source(s) in a highly industrial area.
- The highest PCE soil vapor concentration was detected at the furthest point from the Site on Fruitland Avenue (at sample location 163, see Figure 2). At this sample location, the TCE concentration in the 15-foot sample also was higher than the 15-foot sample results obtained for TCE at the two off-site sample locations (162 and 164) closer to the Site. The higher PCE concentrations at the off-site sample location suggest the presence of an off-site source or sources of VOCs. For example, sample locations 163 is approximately 140 feet northwest of the Site, and approximately 300 feet east of the former solvent recycling facility (referred to as Detrex Solvent Division Facility located on Fruitland Avenue and listed with a land use deed covenant in EnviroStor<sup>1</sup>). At this former facility, a soil removal action was conducted in 2001 to a depth of 20 feet in a localized area that exhibited elevated concentrations of PCE in soil (1100 mg/kg at 4 feet) and soil vapor (34 milligrams per liter at 20 feet) (URS, 2002). Other VOCs, TCE and 1,1,1-TCA, also were detected but at a much lower concentrations. In addition, a recent investigation conducted by Tetra Tech Inc. (May 2011) at a facility located on Fruitland Avenue, approximately 700 feet west of the Site also identified PCE and TCE in soil vapor. At this facility, PCE and TCE were detected in soil vapor at 5 and 20 feet bgs at

<sup>1</sup> EnviroStor, February 2012

concentrations up to 100 µg/L, with the highest concentration reported for PCE in a hazardous materials storage area.

- Calculated molar ratios of PCE to TCE (0.10 and 0.42) are an order of magnitude higher at three of the off-site soil vapor sample locations 162, 163, and 164. The molar ratios calculated for the on-site samples located in the suspected on-site source area ranged between 0.01 and 0.087. The distribution of PCE to TCE is presented graphically on Figures 8 and 9. The PCE to TCE molar ratios further suggest the probability of an off-site source or sources of PCE and TCE in the vicinity of the off-site sample locations 162, 163, and 164.

### **3.4 AMEC SUPPLEMENTAL GROUNDWATER TESTING**

Based on a request from DTSC, a groundwater sampling event was conducted at the Site in May 2011 for VOC and perchlorate testing. Monitoring wells AOW-6 and AOW-8 were redeveloped and sampled in May 2011. Monitoring well AOW-9 could not be developed or sampled due to a migratory bird nesting near the well location. Perchlorate and VOCs were not detected in the groundwater samples collected from AOW-6 and AOW-8. Tabulated analytical results from this sampling event are included in Appendix A of the FS (AMEC 2012a), and the monitoring well locations are shown on Figure 2. Historically, groundwater samples from AOW-8 contained 1,2-DCA, TCE and chloroform, with TCE and 1,2-DCA detected above the respective maximum contaminant levels (MCLs). As discussed in Section 3.6 below, the presence of these compounds in groundwater may be attributed to an off-Site source, and the reduction in VOC concentrations to non-detected levels at AOW-8 indicates natural attenuation of VOCs is already occurring in groundwater beneath the Site.

### **3.54 AMEC SUPPLEMENTAL SOIL AND CONCRETE CHARACTERIZATION**

In July 2009, AMEC submitted the PCBNP (AMEC, 2009) to U.S. EPA for approval of a risk-based application for on-site remediation of PCB releases and disposal of PCB remediation waste (soil and concrete). The PCBNP was prepared in compliance with 40 CFR 761 (Subchapter R, TSCA), including applicable amendments (June 29, 1998, 40 CFR Parts 750 and 761, Disposal of Polychlorinated Biphenyls, Final Rule). Following U.S. EPA's review of the risk-based application, U.S. EPA required additional testing, which included the following:

- collection and analysis of additional concrete cores for PCBs as Aroclors from 50 randomly selected concrete slab areas;
- collection and analysis of soil directly beneath PCB-impacted concrete slabs (referred to as sub-slab soil samples), where the total Aroclor concentration of the concrete slab exceeded the then proposed remediation goal of 5.3 mg/kg for concrete; and
- collection and analysis of additional soil and concrete for PCBs and dioxin-like PCB congeners to support the HHRA and proposed risk-based remediation goals for PCBs.

Specific protocols and sampling requirements were outlined in a draft Concrete and Soil Sampling and Analysis Plan (SAP) (AMEC, 2010a), which was submitted to U.S. EPA pursuant to its conditional approval of the PCBNP (U.S. EPA, 2010). The SAP was approved with modifications by U.S. EPA on August 30, 2010. The sampling covered under the SAP was conducted between September 9, 2010, and October 18, 2010, with final laboratory analytical data received on November 8, 2010. The results of the additional PCB (tested Aroclors and sum of detected Aroclors) concrete and soil sampling are provided in Appendix A of the FS (AMEC, 2011a2012a); a summary of total Aroclor concentrations for the 2010 concrete samples are shown on Figure 4.

### 3.65 AREAS OF IMPACT

Although the screening criteria described in Section 3.2.1 are not intended to be remediation goals, one or more COPCs were detected in soil and/or concrete at concentrations above these screening criteria during the Phase II and Supplemental Phase II investigations conducted by Geomatrix and AMEC. The areas identified as impacted by one or more COPCs with concentrations exceeding these initial screening criteria are described below and sample locations are shown on Figures 3 and 4.-

With the exception of storm water outfalls #6 and #7 and former hot well area, these areas were not previously identified as being impacted by VOCs or PCBs.

- Northern Portion of Buildings 106, 108, and 112 – TCE was detected in soil vapor, soil, and groundwater in the northwestern portion of the Site. Data collected to date indicate the likely presence of a source of VOCs in soil and groundwater in the northwest corner of Building 106. TCE and tetrachloroethene (PCE) concentrations detected in soil exceed the U.S. EPA Region IX SSL for the protection of groundwater (using a DAF20) in this area. TCE was detected in groundwater samples collected from a depth of approximately 150 feet bgs at concentrations ranging from 72 to 420 µg/L. In addition, PCBs were detected in the concrete slab in portions of these buildings, and PCBs were detected in sub-slab soil samples at three discrete locations between Building 106 and 108 (sample locations 191, 193 and 195).
- Off site Northwest of Building 106 - the investigation of off-site soil vapor concentrations to the northwest of Building 106, at the intersection of Fruitland and Boyle Avenues, identified TCE and PCE in shallow soil vapor samples at depths of 5 and 15 feet (sample locations 161 through 164; Figures 5 and 6). At these off-site locations, TCE soil vapor concentrations decreased to the north, northwest and west of the Site, while the PCE soil vapor concentrations increased. For comparison, the molar ratios of PCE to TCE (0.10 and 0.42) were an order of magnitude higher at three of the off-site soil vapor sample locations. The molar ratios calculated for the on-site samples from the suspected source area ranged between 0.01 and 0.087. The observed higher PCE concentrations and PCE to TCE molar ratios suggest the probability of an off-site source or sources of PCE and TCE in the vicinity of the off-site sample locations (162, 163, and 164).

## DRAFT RAP

- Southern Portion of Building 106 – aromatic VOCs, primarily benzene, were detected in soil and groundwater in the southern portion of the building at borings 125 and 135. Benzene was detected in groundwater samples at concentrations ranging from 2.8 to 3.3 µg/L. PCBs also were detected in the concrete slab at the southwest corner of this building, at isolated locations within the sub-slab soil (sample locations S-1 and 39) underlying the concrete slabs, and at near former Substation 8 (sample location S-1).
- Storm Water Outfall #7 – PCBs were detected in soil at a depth of 5.7 feet bgs at boring 182.
- Existing and Former Vertical Pits in Building 104 – PCBs were detected in soil to a depth of 31 feet bgs at boring 98 and at depths between 10 and 71.5 feet bgs at borings 40, 94, 95, and 189.
- Northwestern Portion of Building 104 – PCBs were detected in the concrete slab at the northwest corner of the building. PCBs were not detected in soil samples from borings 115, 116, 117, 118, and 119 located in this area of the building or from the sub-slab soil sample locations 215 through 225.
- Saw Area in Building 104 – PCBs were detected in soil to a depth of 3 feet bgs at borings 41, 73, and 100 and from the sub-slab soil sample locations 228 through 233 and 236. PCBs also were detected in the overlying concrete slabs near these boring and sample locations and surrounding the location of the saw.
- Former Hot Well area – PCBs were detected in soil at a depth of 2.7 feet bgs at boring 175.
- Building 112A and West of Building 112A – Stoddard solvent and associated VOC compounds (naphthalene, trimethylbenzenes, and xylenes) were detected in soil vapor at depths of 5 and 15 feet bgs.
- Former Scalper/Planar Area – PCBs were detected in soil at a depth of 0.8 feet bgs at boring 183.
- Near Storm Water Outfall #6 – copper and lead were detected at a depth of 6.2 feet bgs at former boring 47, and arsenic was detected at a depth of 6.0 feet bgs at boring 113. PCBs also were detected in soil at a depth of 4.5 feet bgs at boring 176.

In order to further evaluate these areas of impacted soil vapor, soil or concrete, the Phase II data, the Supplemental Phase II investigation data, and all other COPCs detected in soil and soil vapor at the Site were evaluated for potential human health risks using a screening-level HHRA pursuant to NCP 40 CFR 300.430(d)(1) and DTSC guidance documents. The screening-level HHRA and the potential impacts of these COPCs to groundwater are presented and evaluated in the FS (AMEC, 2011a2012a). A summary of the screening-level HHRA is presented in Section 5.0.

### 3.7 GROUNDWATER IMPACTS AND NATURAL ATTENUATION

Groundwater samples collected at the Site contain TCE at concentrations above the MCL, and based on Site data and the reported groundwater flow direction (west-northwest), there are at least three potential sources of TCE and VOCs in groundwater as described below.

Tabulated groundwater analytical results are included in Appendix A of the FS (AMEC, 2012a).

- Northwest portion of the Site: TCE impacts to groundwater in this portion of the Site may be attributed, to some degree, to historical manufacturing operations in the northwestern portion of the Site (e.g. Building 106 as described further in Section 3.6). This statement is based on the detection of TCE and other VOCs in the northwest portion of the Site in soil, soil vapor, and groundwater samples. In this area of the Site, TCE was detected in hydropunch groundwater samples from sample locations 125, 126, 132, 133, and 134 at concentrations ranging between 71 and 420 µg/L.
- Off-site Source(s) to the south, southeast, and southwest: TCE and other VOC impacts to groundwater in the southern portion of the Site, near the former Stoddard solvent USTs, may be attributed to an off-site source or sources. This statement is based on the fact that TCE or other related VOCs were not detected in soil and soil vapor samples collected in the southern portion of the Site. Historical records reviewed at the RWQCB and on GeoTracker<sup>2</sup>, suggest the presence of several off-site sources including the former Bethlehem Steel site, located upgradient of the Site (just south of Slauson Avenue – also known as Vernon Parcels/Lots) and the former Trico site located southwest of the intersection of Boyle Avenue and Slauson Avenue (Environmental Audit Inc., 2009). In addition, detected concentrations of the chlorinated VOCs, 1,2-DCA, chloroform, and TCE in groundwater in the southern portion of the Site (former monitoring wells AOW-3 and AOW-7 and existing monitoring wells AOW-8, and AOW-9; see Figure 2) have decreased (attenuated) since the initial sampling event in 1991.
- Off-site source(s) to the east: TCE impacts to groundwater may be present to the east of the Site, beyond Alcoa Avenue. This statement is based on historical groundwater data collected from a former Alcoa monitoring well AOW-4, which was located in the northeast corner of the original Alcoa property (see Figure 2) near the intersection of Alcoa Avenue and Fruitland Avenue. During previous monitoring events, TCE was detected in the groundwater samples collected from monitoring well AOW-4 at concentrations up to 220 µg/L, indicating the presence of another potential regional source of TCE in groundwater east of the Site. In addition, the TCE concentrations reported for monitoring well AOW-4 decreased with time since the initial sampling event in 1990.

### 4.0 REMOVAL ACTIONS COMPLETED TO DATE

This section summarizes removal actions and follow-up, additional investigations performed by Alcoa, along with facility building demolition actions performed by Pechiney.

<sup>2</sup> GeoTracker, February 2012



#### 4.1 ALCOA'S PREVIOUS REMEDIAL ACTIVITIES

Consultants to Alcoa have previously conducted remediation activities in specific areas of the Site under the direction of the City of Vernon H&EC. These remediation activities are briefly described below.

- July to October 1992 – excavation of diesel fuel-impacted soil in conjunction with removal of three 10,000-gallon diesel USTs and a pump vault located south of electrical substation #2. The excavations were backfilled with engineered fill, compacted, and capped with concrete (OHM Remediation Services Corporation, 1992).
- January 1995 – removal of four 10,000-gallon Stoddard solvent USTs located west of Building 112A. The maximum excavation depth was 18 feet bgs. The area was backfilled with Stoddard solvent-impacted soil from 3 to 18 feet bgs. At that time, the City of Vernon H&EC “agreed that Alcoa could place the contaminated soil back into the excavation, provided that Alcoa would remediate the Site within a reasonable time frame” (CCG Group, Inc., 1995). A 6-mil plastic liner was placed over the Stoddard solvent-impacted soil, and clean soil was backfilled over the liner from 3 feet bgs to grade. The area was then capped with concrete.

Following the removal of the Stoddard solvent USTs and delivery system in January 1995, Alcoa conducted a soil investigation to evaluate the extent of the Stoddard solvent impacts (Morrison Knudsen Corporation, 1995). A number of investigations were performed by Alcoa between 1995 and 2005 (Environmental Protection and Compliance, 2006), and these investigations are described below.

- September through October, 1995 – Alcoa conducted an initial soil investigation to evaluate the extent of Stoddard solvent-related soil impacts beneath Building 112A and west of the building near the former Stoddard solvent USTs (Morrison Knudsen Corporation, 1995). The areas investigated included the former tube mill and roll stretcher machine area (Area “A” borings), the former tube mill Stoddard solvent dip tanks and vault (Area “B” borings), the scalper planar machine and Stoddard feed line area (Area “C” borings), and the Stoddard solvent still house and UST area (Area “D” borings). Soil borings were advanced to depths between 45 to 67.5 feet bgs and cone penetration test/rapid optical screening test (CPT/ROST) borings were advanced to depths between 34 and 80.7 feet bgs. Petroleum hydrocarbon analyses included quantification of total volatile petroleum hydrocarbons (TVPH; carbon-chain range of c6 – c10) and total extractable petroleum hydrocarbons (TEPH; carbon chain range of c10 – c28). The soil TVPH concentrations ranged between 1.1 milligram-per-kilogram (mg/kg) to 76,000 mg/kg and TEPH concentrations ranged between 5.4 mg/kg to 53,000 mg/kg. The highest concentrations of these compounds were detected in Area B at depths between 46.5 and 50 feet bgs. Several soil samples also were tested for BTEX compounds, and these compounds were detected in soil. Based on AMEC’s review of the soil sample analytical results and qualitative petroleum hydrocarbon measurements obtained by CPT/ROST methods, the extent of these soil-impacts was assessed with the exception of two areas. The vertical extent of petroleum hydrocarbon-impacted soil was not completely assessed in Areas B and D.

The approximate lateral extent of the Stoddard solvent-related soil impacts are shown on Figure 3 and the historical analytical soil results are included in Appendix A of the FS (AMEC, ~~2011a~~2012a).

- August to November 1995 – Alcoa completed laboratory bench-scale treatability testing on Stoddard solvent-impacted soils obtained from the subsurface in the vicinity of former solvent handling and storage areas within Building 112A. The testing was conducted to determine the applicability of in situ bioremediation of vadose zone soils. The treatability testing included the use of bioslurry reactor vessels and soil column reactors (Alcoa Technical Center, 1996a).
- Analytical testing indicated that appropriate environmental conditions (including pH, naturally occurring nutrients, indigenous microbial populations, and soil moisture) existed to depths of 45 feet bgs that would be supportive of in situ biodegradation of Stoddard solvent-impacted soil. The primary findings associated with the bioslurry reactor testing indicated that under optimal test conditions, 50 percent of the hydrocarbons were degraded within four weeks under aerobic conditions within the reactor, and that less than 5 percent of the hydrocarbons were lost due to volatilization. The primary findings from column reactor studies further supported that Stoddard solvent-impacted soils were amenable to biodegradation as hydrocarbon concentrations were reduced by 93 to 95 percent using a combination of biodegradation (80 percent) and volatilization (13 to 14 percent). Furthermore, significantly high levels of heterotrophic bacteria ( $10^8$  to  $10^9$  colony forming units per gram of soil dry weight [cfu/gm-dw soil]) and hydrocarbon degraders ( $10^5$  to  $10^6$  cfu/gm-dw soil) were found to be present within the soil (Alcoa Technical Center, 1996a). The results indicated that the addition of moisture and nutrients did not significantly alter degradation rates of the hydrocarbons.
- In 1995, on behalf of Alcoa, Morrison Knudsen Corporation and Groundwater Technology performed field trial tests to evaluate the applicability of soil vapor extraction (SVE) and bioventing technologies as remedial alternatives to mitigate the Stoddard solvent-impacted soils at the Site. Test procedures consisted of both vapor extraction and air injection with monitoring for oxygen, carbon dioxide, and soil gas. The report concluded that both technologies were viable and could be implemented if desired to remediate the Stoddard solvent-impacted soils (Alcoa Technical Center, 1996a).
- In 1996, Alcoa generated additional field respirometry testing data suggesting that naturally-occurring aerobic and anaerobic intrinsic bioremediation was ongoing at the Site. The data indicated that natural aerobic degradation was occurring due to available molecular oxygen at rates of 200 to 400 mg/kg per year (mg/kg/year). The data also indicated that much slower degradation rates of 7 mg/kg/year were occurring through anaerobic biodegradation. The report indicated that Alcoa proposed intrinsic bioremediation (also referred to as monitored natural attenuation) as the passive full-scale remediation approach for Stoddard solvent-impacted soils (Alcoa Technical Center, 1996b).

- September and October 2005 - Alcoa conducted additional soil testing in 2005 to monitor the progress of the natural degradation of Stoddard solvent-related soil impacts in soil boring areas A, B, C and D (Environmental Protection and Compliance, 2006). AMEC compared the soil data collected in 2005 by Environmental Protection and Compliance to the soil data collected in 1995 by Morrison Knudsen Corporation to evaluate petroleum hydrocarbon concentration changes over time. The findings of this comparison are summarized below.

Area	Findings
A	<ul style="list-style-type: none"> <li>TVPH and TEPH concentrations decreased over time.</li> <li>Remaining TVPH and TEPH maximum concentrations reported in 2005 were at 6080 mg/kg and 6200 mg/kg, respectively.</li> <li>Concentrations greater than 1000 mg/kg remain at depths of 30 and 40 feet.</li> <li>Vertical extent of soil impacts was assessed to 60 feet.</li> </ul>
B	<ul style="list-style-type: none"> <li>TVPH and TEPH concentrations increased over time at several depth intervals.</li> <li>Remaining TVPH and TEPH maximum concentrations reported in 2005 were at 41,600 mg/kg and 60,600 mg/kg, respectively (at a depth of 45 feet in boring B-1).</li> <li>Concentrations greater than 10,000 mg/kg remain at depths of 45 and 50 feet.</li> <li>Vertical extent was not assessed; TPH-impacted soil was detected to a depth of 50 feet.</li> </ul>
C	<ul style="list-style-type: none"> <li>TVPH and TEPH concentrations decreased over time.</li> <li>Remaining TVPH and TEPH maximum concentrations reported in 2005 were at 2220 mg/kg and 2500 mg/kg, respectively.</li> <li>TVPH concentrations greater than 1000 mg/kg remain at a depth of 15 feet and TEPH concentrations greater than 1000 mg/kg remain at depth of 45 feet.</li> <li>Vertical extent of soil impacts was assessed to 65 feet.</li> </ul>
D	<ul style="list-style-type: none"> <li>TVPH and TEPH concentrations increased over time at several depth intervals.</li> <li>Remaining TVPH and TEPH maximum concentrations reported in 2005 were at 6020 mg/kg and 10,800 mg/kg (at 45 feet at boring D-2).</li> <li>TVPH and TEPH concentrations greater than 1000 mg/kg remain at depths of 15, 43, and 44.5 feet and TEPH concentrations greater than 10,000 mg/kg remain at a depth of 45 feet.</li> <li>Vertical extent was not assessed; TPH-impacted soil was detected to a depth of 45 feet.</li> </ul>

- Based on the soil investigations and treatability testing described in a report prepared by Environmental Protection and Compliance in 2006, Alcoa recommended to the City of Vernon H&EC that long-term natural attenuation of the Stoddard solvent-impacted soils beneath Building 112A be allowed to continue as a passive remedy (Alcoa Technical Center, 1996c). The City of Vernon H&EC replied that the remaining Stoddard solvent contamination still exceeded cleanup standards and required Alcoa to submit a plan by August 31, 2006 for active remediation of this area (City of Vernon, 2006). Alcoa has not submitted its active remediation plan and has not performed any additional monitoring or active remediation work in this area. Alcoa's refusal to submit an

active remediation plan is documented in an August 30, 2006 letter that Alcoa submitted to the City of Vernon H&EC (Alcoa, 2006).

- April 1998 – excavation of TPH-impacted soil in conjunction with removal of the Stoddard solvent Tube Mill dip tank located in Building 112A. The maximum excavation depth was 15 feet bgs. The area was backfilled with pea gravel and capped with concrete (A.J. Ursic, Jr., 1999a).
- June 1998 – excavation of TPH-impacted soil in conjunction with the removal of a sump from the 3-inch tube reducer foundation located in Building 112A. The maximum excavation depth was 5 feet bgs. The area was backfilled with native soil and capped with concrete (A.J. Ursic Jr., 1999a).
- October 1998 – excavation of refractory and asbestos-containing materials found in soil in conjunction with the construction of a sanitary pipeline located east of Building 112A. The maximum excavation depth was 4 feet bgs. The area was backfilled with road base and capped with asphalt (A.J. Ursic Jr., 1999a).
- December 1998 – excavation of PCB- and TPH-impacted soil in conjunction with the removal of an inert waste disposal pit located west of Building 112A and south of the cooling tower. The maximum excavation depth was 45 feet bgs. Soil removal was terminated due to the proximity of the railroad tracks along the south and west sides of the excavation. The area was backfilled with soil and road base and capped with concrete (A.J. Ursic Jr., 1999a).
- January 1999 – excavation of PCB-impacted soil near storm water outfall #7 located west of Building 104. The maximum excavation depth was 6 feet bgs. The area excavated was limited by the presence of the adjacent sidewalk, building structures, and railroad tracks. The area was backfilled and capped with road base (A.J. Ursic Jr., 1999b).
- April 1999 – excavation of PCB-impacted soil at the discharge point of storm water outfall #6 located southwest of the cooling tower. The maximum excavation depth was 2 feet bgs. The area was backfilled and capped with road base (A.J. Ursic Jr., 1999a).
- April 1999 – excavation of PCB-impacted soil adjacent to the hot well along the north side of the cooling tower. The maximum excavation depth was 3 feet bgs. The area was backfilled and capped with road base (A.J. Ursic Jr., 1999a).
- May 1999 – excavation of PCB-impacted soil in conjunction with removal of a former condenser pad located outside the northwest corner of Building 106. The maximum excavation depth was 2 feet bgs. The area was backfilled with native soil and capped with concrete (A.J. Ursic Jr., 1999b).
- May 1999 – excavation of lead-impacted soil from a former ceramic disposal pit located beneath Building 135 on Parcel 6. The maximum excavation depth was 2 feet bgs. The area was backfilled with native soil and capped with asphalt (A.J. Ursic Jr., 1999c).

- June 1999 – excavation of PCB-impacted soil in conjunction with the removal of a French drain in Press Pit #2 located in Building 106. The maximum excavation depth was 7 feet bgs. The area was backfilled and capped with concrete (A.J. Ursic Jr., 1999b).

The areas where previous remediation activities occurred as described above, including approximate horizontal limits of the excavation, excavation depth, and concentrations of remaining COPC, are shown on Figure 3. As discussed in the FS (AMEC, 2011a2012a) and Section 3.1 of this document, the City of Vernon H&EC issued a closure letter to Alcoa in 1999 with the stipulation that Alcoa would continue to maintain responsibility for the Stoddard solvent-impacted soil. The letter also stated that further review or determinations may be necessary if new information related to environmental conditions at the Site is found (City of Vernon, 1999).

#### **4.2 ABOVE-GRADE FACILITY DEMOLITION**

Facility above-grade hazardous materials abatement and demolition work were completed at the Site in November 2006 by Pechiney under the direction of the City of Vernon H&EC. The work included removal and recycling or disposal of all above-ground building structures. The concrete building slabs (including those impacted by PCBs) and surrounding pavements were not removed during the above-grade demolition work. Additional testing of the concrete slabs for PCB has been conducted and was summarized earlier in Sections 3.2.3 and 3.54. These features remain in-place and will be removed as part of the below-grade demolition work described in this RAP. A summary of the above-grade demolition work is included in the Above Grade Demolition Completion Report dated December 26, 2006 (Geomatrix, 2006d).

#### **5.0 SUMMARY OF SITE RISKS AND SITE-SPECIFIC REMEDIATION GOALS**

As part of the FS for the Site (AMEC, 2011a2012a), and pursuant to NCP 40 CFR 300.430(d)(1) and DTSC guidance and policy, AMEC conducted a screening-level HHRA to evaluate the potential human health risks associated with exposures to COPCs at the Site. This screening-level HHRA was conducted for individual "Phase areas" at the Site (Phase I through Phase VI), that were developed to facilitate future below-grade demolition work and the anticipated plans for future site use(s); which may include the construction and operation of a power plant and/or commercial/industrial facilities. Based on the results of the screening-level HHRA, COCs were identified, and site-specific risk-based and other remediation goals (collectively referred to herein as site-specific remediation goals) were proposed to address COC concentrations (AMEC, 2011a2012a). The HHRA, identification of COCs, and development of site-specific remediation goals are summarized in this section.

## 5.1 EXPOSURE POPULATIONS AND PATHWAYS

Potential risks were evaluated for human receptors under current and hypothetical future land use scenarios. Ecological receptors were not evaluated because the Site and surrounding areas are highly industrialized, providing poor quality habitat for such receptors. Furthermore, U.S. Fish and Wildlife Service determined the Site was not located within the vicinity of any federally listed species, their designated critical habitat, or other Federal trust resources under their jurisdiction (February 1, 2010, email communication with William B. Miller of the U.S. Fish and Wildlife Service).

Human receptors were identified based on anticipated plans for future site use(s); there is no current use of the Vernon Facility. Because the property is being purchased by the City of Vernon for commercial/industrial use, potential future receptors at the Site include outdoor or indoor commercial/industrial workers and construction workers involved in future construction and grading work at the Site. The construction worker receptor is assumed to spend 100 percent of his time outdoors and addresses potential exposure of future short-term utility maintenance workers. No other land use (i.e., residential) is reasonably anticipated for the Site given that a ~~deed-land use~~ covenant is proposed to be issued for the property restricting zoning and use of the Site to commercial/industrial purposes. Furthermore, the City of Vernon zoning laws prohibit new residential development within the City of Vernon. Commercial/industrial workers at the adjacent or nearby facilities and short-term utility maintenance workers were considered potential off-site receptors.

On site, the exposure pathways considered potentially complete for COPCs in soil for both outdoor commercial/industrial workers and construction workers and evaluated in the HHRA include:

- incidental ingestion of soil;
- dermal contact with soil;
- inhalation of soil particulates in ambient air; and
- inhalation of VOCs in ambient air (released from soil, soil vapor, or groundwater).

For the soil pathways, exposure was only considered potentially complete for the upper 15 feet of soil. Exposure also was considered potentially complete for the soil pathways to PCBs in concrete, because on-site concrete may be crushed and reused as fill soil in excavations and foundation removal areas. Finally, exposure also was considered potentially complete for the volatile COPCs in soil, soil vapor, or groundwater via inhalation of these compounds in ambient air for outdoor commercial/industrial workers and construction workers and via inhalation of these compounds in indoor air for indoor commercial/industrial workers. Because

soil vapor data are considered to be more appropriate than soil data for evaluating potential vapor exposure, soil vapor samples collected in each Phase area of the Site (except for the Phase VI area where VOCs were not detected in soil) were used instead of soil data to evaluate potential vapor movement to air and inhalation exposure. Potential vapor movement of VOCs in groundwater to indoor air was evaluated separately to differentiate vadose zone from groundwater impacts.

On-site use of groundwater found in the first water-bearing unit (interpreted to be the upper portion of the Exposition aquifer) will be restricted as part of the land use deed-covenant to be issued for the Site. Although groundwater from the first water-bearing unit is not currently used on or off site for potable supply (according to the City of Vernon H&EC, groundwater is produced off site from the Jefferson, Lynwood, Silverado, and Sunnyside aquifers from depths of approximately 450 to 1400 feet bgs), the RWQCB Basin Plan (RWQCB, 1994) designated groundwater in the Site vicinity for beneficial use. Therefore, potential exposure to impacted site groundwater found in the upper portion of the Exposition aquifer was evaluated. Furthermore, the potential threat of COPC movement from soil or concrete to groundwater was also evaluated.

Off-site exposure to COPCs in on-site soil was considered potentially complete for outdoor commercial/industrial workers and utility maintenance workers through inhalation of particulates and VOCs in ambient air. Exposure may also be potentially complete for off-site indoor commercial/industrial workers to VOCs moving from on-site groundwater or soil vapor into off-site indoor air. However, for COPCs detected in on-site soil, soil vapor, or groundwater, the evaluation of on-site exposures was assumed to be protective of off-site exposures. Potential off-site exposure to site-related COPCs in soil vapor at the intersection of Fruitland and Boyle Avenues was evaluated separately.

## 5.2 RISK EVALUATION

Potential human health risks were evaluated using risk-based screening levels (RBSLs) developed using the methodology presented by the Office of Environmental Health Hazard Assessment (OEHHA) for California Human Health Screening Levels (OEHHA, 2005), and exposure parameters recommended by the DTSC (DTSC, 2005), as well as other recent OEHHA and DTSC guidance documents (OEHHA, 2009; DTSC, 2009). Potential use of groundwater was evaluated using available State or Federal maximum-contaminant-levels (MCLs) instead of RBSLs.

Risks from exposure to COPCs in soil and soil vapor were evaluated independently for each Phase area by comparing maximum chemical concentrations to the RBSLs. Potential vapor intrusion risks from VOCs in groundwater were evaluated for the entire Site by comparing site-

wide maximum chemical concentrations in groundwater to RBSLs. Predicted lifetime excess cancer risks and non-cancer hazard quotients (HQs) were calculated from the ratios of concentrations to RBSLs, with cumulative effects from exposure to multiple chemicals evaluated by summing the chemical-specific cancer risks or HQs by exposure medium, and then summing across all media.

Potential exposure to PCBs in crushed concrete and COPCs (TCE and PCE) in off-site soil vapor, and the potential use of groundwater were evaluated separately. Potential exposure to PCBs in crushed concrete was evaluated for each Phase area by comparing maximum concrete concentrations to the RBSLs for soil. Potential exposure to TCE and PCE in off-site soil vapor (at the intersection of Fruitland and Boyle Avenues) was evaluated by comparing detected soil vapor concentrations to the indoor commercial/industrial worker RBSLs. Finally, the potential use of groundwater was evaluated by comparing site-wide maximum detected concentrations in groundwater samples from the first water-bearing unit to MCLs. In addition, potential impacts to groundwater from COPCs in soil and concrete (i.e., through leaching) were evaluated by comparing detected concentrations in soil to RWQCB or U.S. EPA Region IX groundwater protection criteria, and then developing site-specific screening levels for the COPCs above these criteria or for which the initial screening levels were not available.

The screening-level HHRA resulted in the following predicted lifetime excess cancer risks and noncancer hazard indices (HIs; the sum of chemical- and medium-specific HQs) for indoor commercial/industrial worker, outdoor commercial/industrial worker, and construction worker exposure to COPCs in soil and soil vapor in the upper 15 feet of the vadose zone.

<b>Summary of Maximum Predicted Lifetime Excess Cancer Risks and Noncancer Hazard Indexes – Cumulative Soil and Soil Vapor Exposure</b>						
<b>Area</b>	<b>Cancer Risks</b>			<b>Noncancer HIs</b>		
	Indoor C/I <sup>1</sup> Worker	Outdoor C/I Worker	Construction Worker	Indoor C/I Worker	Outdoor C/I Worker	Construction Worker
Phase I	<b>4E-04</b>	<b>2E-03</b>	<b>3E-04</b>	<b>2</b>	0.02	0.2
Phase II	6E-07	<b>4E-03</b>	<b>6E-04</b>	0.004	<b>3</b>	<b>10</b>
Phase IIIa	-- <sup>2</sup>	<b>1E-04</b>	<b>2E-05</b>	-- <sup>2</sup>	1	<b>7</b>
Phase IIIb	3E-07	3E-07	5E-08	<b>53</b>	1	<b>4</b>
Phase IV	3E-07	<b>1E-04</b>	<b>2E-05</b>	<b>38</b>	<b>2</b>	<b>18</b>
Phase V	1E-07	5E-10	2E-08	0.002	0.003	0.03
Phase VI	-- <sup>2</sup>	<b>6E-05</b>	<b>1E-05</b>	-- <sup>2</sup>	0.4	<b>5</b>



**Notes:**

Cancer risks (greater than  $1 \times 10^{-4}$ ) and HIs (greater than 1) above DTSC points of departure (a cumulative lifetime excess cancer risk of  $1 \times 10^{-6}$ ; an HI of 1) ~~the ranges considered acceptable by regulatory agencies are~~ **bold**.

1. Commercial/Industrial (C/I)
2. No volatile organic compounds were detected in soil or soil vapor in the Phase IIIa or Phase VI areas.

As presented in the table above, for cumulative soil and soil vapor exposures, the predicted lifetime excess cancer risks for the indoor commercial/industrial worker in the Phase I area; and the outdoor commercial/industrial worker and construction worker in the Phase I, and Phase II, Phase IIIa, Phase IV, and Phase VI areas; and the construction worker in the Phase I and Phase II areas are above the DTSC point of departure ( $1 \times 10^{-6}$ ) risk management range. The other cancer risks estimated were either within or below this risk management range  $1 \times 10^{-6}$ . The maximum predicted noncancer HIs for the indoor commercial/industrial worker in the Phase I, Phase IIIb, and Phase IV areas; the outdoor commercial/industrial worker in the Phase II and Phase IV areas; and the construction worker in the Phase II, Phase IIIa, Phase IIIb, Phase IV, and Phase VI areas are above the DTSC point of departure acceptable range for noncarcinogenic effects (less than or equal to 1). The other HIs estimated for cumulative soil and soil vapor exposures were all at or below 1, with the majority being well below 1. In summary, maximum concentrations of chemicals resulted in risks or hazard indexes above target levels in the Phase I, Phase II, Phase IIIa, Phase IIIb, Phase IV, and Phase VI areas for one or more receptors.

The results of the independent screening of PCBs in concrete, TCE, and PCE in off-site soil vapor, and COPCs in site groundwater are summarized as follows.

**Aroclors:** Detected concentrations of Aroclor-1248, -1254, and -1260 mixtures in concrete were found to exceed their respective RBSLs in the following Phase I, Phase II, and/or Phase IV areas. The maximum detected concentrations by Phase Area relative to RBSLs are presented in the table on the next page.:

Area	Maximum Detected Concentrations of Aroclor Mixtures in Concrete (mg/kg)			
	Aroclor-1016	Aroclor-1248	Aroclor-1254	Aroclor-1260
Phase I	ND <sup>1</sup>	<b>390</b>	<b>5.8</b>	<b>200</b>
Phase II	<b>0.026</b>	<b>3,300</b>	<b>0.26</b>	<b>5</b>
Phase IIIa	ND	0.1	ND	ND
Phase IV	<b>0.32</b>	<b>0.4</b>	<b>1</b>	<b>0.28</b>
<b>Risk-Based Screening Levels (RBSLs) (mg/kg)</b>				
Outdoor Commercial/ Industrial Worker	Cancer-Based RBSL	0.53	0.53	0.53
	Noncancer-Based RBSL	26	NA <sup>2</sup>	7.5
Construction Worker	Cancer-Based RBSL	3.5	3.5	3.5
	Noncancer-Based RBSL	<b>6.9</b>	NA	2

**Notes:**

Maximum detected concentrations that exceed at least one RBSL are bold.

1. Not detected (ND). 2. Not applicable (NA)

As presented, the maximum detected cPhase I Area: Concentrations of Aroclor-1248, -1254, and -1260 in the Phase I area were found to exceed the outdoor commercial/industrial worker and construction worker cancer-based RBSLs (0.53 and 3.5 mg/kg, respectively), with the maximum detected cConcentrations of Aroclor-1254 were also found to exceed the construction worker noncancer-based RBSL (2.0 mg/kg). In the Phase II Area, the maximum detected cConcentrations of Aroclor-1248 and -1260 were found to exceed the outdoor commercial/industrial worker and construction worker cancer-based RBSLs (0.53 and 3.5 mg/kg, respectively). Finally, in the Phase IV Area, the maximum detected concentration of Aroclor-1254 was found to exceed the outdoor commercial/industrial worker cancer-based RBSL (0.53 mg/kg).

**PCE and TCE on off-Site Soil Vapor:** Detected concentrations of PCE and TCE in off-site soil vapor were found to exceed the indoor commercial/industrial worker cancer-based RBSLs (2.2 µg/L and 6.3 µg/L, respectively).

**Groundwater:** Site-wide, maximum Detected concentrations of benzene, chloroform, 1,2-DCA, dichloromethane, and TCE in site groundwater were found to exceed their respective MCLs.

### 5.3 IDENTIFICATION OF COCs

The COPCs in soil or soil vapor that individually contributed cancer risk levels of at least  $1 \times 10^{-6}$  or HQs of at least 1 in the human health exposure evaluation and were identified as COCs include:

- PCB mixtures Aroclor-1232, Aroclor-1248, Aroclor-1254, and Aroclor-1260 in soil;
- arsenic in soil;
- TPH as c6-c10 hydrocarbons in soil; and
- chloroform, PCE, TCE, TPH as Stoddard solvent, 1,2,4-trimethylbenzene (1,2,4-TMB), and 1,3,5 trimethylbenzene (1,3,5-TMB) in soil vapor.

With concentrations of Aroclor-1248, Aroclor-1254, and Aroclor-1260 in concrete in the Phase I, Phase II, and Phase IV areas exceeding RBSLs, these PCB mixtures were also identified as COCs in concrete. Additional COPCs in soil were identified as exceeding the site-specific soil screening levels for the protection of groundwater and were thus identified as COCs: the BTEX compounds, 1,2 DCA, PCE, TCE, TPH as specific carbon ranges (c5-c10, c6-c10, c7-c12, c10-c20, c10-c28, and c21-c28), and TPH as Stoddard solvent. Finally, the COPCs in groundwater that exceeded their respective MCLs were identified as COCs: benzene, chloroform, 1,2-DCA, dichloromethane (i.e., methylene chloride), and TCE. With the exception of dichloromethane, these COCs were detected in groundwater as recent as 2006. No additional COPCs in groundwater were identified as COCs based on the screening of site-wide maximum detected groundwater concentrations against vapor intrusion RBSLs. The potential lifetime excess cancer vapor intrusion risks from vapor intrusion of VOCs in groundwater were above the DTSC point of departure ( $1 \times 10^{-6}$ ), but below the cumulative target cancer risk level of  $1 \times 10^{-5}$  and target HI proposed for the Site ( $10^{-5}$  as described in Section 5.4 below and 1, respectively). The noncancer HI from vapor intrusion of VOCs in groundwater was below the DTSC point of departure for noncarcinogenic effects (an HI less than or equal to 1).

### 5.4 SUMMARY OF SITE-SPECIFIC REMEDIATION GOALS

Site-specific remediation goals were established for COCs in soil vapor, soil, and concrete at the Site under various future commercial/industrial land use scenarios (e.g., commercial/industrial land use). Development of these site-specific remediation goals is described in detail in Section 5.2 of the FS (AMEC, 2011a/2012a). Remediation goals derived to be protective of potential human health risks were developed using  $1 \times 10^{-5}$  as a cumulative target cancer risk level and 1 as a cumulative target noncancer HI. Both targets were set as "acceptable" levels for cumulative chemical exposure related to commercial/industrial re-use of the Site with the issuance of a land use covenant, in coordination with the U.S. EPA risk

management team responsible for approval of the risk-based application for PCBs and DTSC during a conference call on April 27, 2010. The resulting site-specific remediation goals, with explanations provided for how each value was established, are provided in Tables 1A, 1B, and 1C. In summary, the site-specific remediation goals are as follows:

Remediation Goals Established for COCs in Shallow Soil Vapor – for potential future commercial/industrial indoor air exposure (Table 1A) follow.

1. VOCs in shallow soil vapor (at 5 and 15 feet bgs):

- chloroform – **6.7 µg/L**
- PCE – **7.3 µg/L**
- TCE – **21 µg/L**
- TPH as Stoddard solvent – **500 µg/L**
- 1,2,4-TMB – **12.3 µg/L**
- 1,3,5-TMB – **10.7 µg/L**

Remediation Goals Established for COCs in Soil and Concrete – for future commercial/industrial use scenarios (Table 1B) follow.

1. PCBs in Shallow Soil (0 to 15 feet bgs):

- Aroclor-1254 – **2.0 mg/kg**;
- Total Aroclors – **3.5 mg/kg** for soil that may be left exposed at the surface (0 to 5 feet bgs); and
- Total Aroclors – **23 mg/kg** for subsurface soil (5 to 15 feet bgs) that only construction workers may come into contact with during excavation, grading, etc. (and that would remain at 5 to 15 feet bgs).

2. PCBs in Concrete:

- Total Aroclors – **3.5 mg/kg**

3. Metals in Shallow Soil (0 to 15 feet bgs):

- Arsenic – **10 mg/kg**

4. TPH in Shallow and Deeper Soil (surface to groundwater, at approximately 150 feet bgs).

- c5-c10 hydrocarbons, c6-c10 hydrocarbons, c7-c12 hydrocarbons, and TPH as Stoddard solvent – **500 mg/kg** (gasoline range hydrocarbons);
- c10-c20 hydrocarbons and c10-c28 hydrocarbons – **1,000 mg/kg** (diesel range hydrocarbons); and
- c21-c28 hydrocarbons – **10,000 mg/kg** (residual fuel range hydrocarbons)

VOCs in Shallow and Deeper Soil (surface to groundwater, at approximately 150 feet bgs) – depth-specific remediation goals for TCE, PCE, BTEX, and 1,2-DCA are presented in Table 1C.

Boring or sample locations with matrix sample concentrations above the site-specific remediation goals are shown on Figure 9 of the FS (AMEC, 2011a2012a).

Remediation goals were not established for the COCs identified in groundwater. A monitored natural attenuation (MNA) remedial approach will be applied to groundwater at the Site. As required by DTSC, an additional groundwater monitoring well will be installed in the northwest corner of the Site to support the MNA approach. This is discussed further in the FS. The MNA approach is proposed for the Site for the following reasons:

- presence of low concentrations of chlorinated VOCs, with the concentration of TCE ranging between 3 and 420 µg/L in groundwater samples collected beneath the Site.
- depth at which groundwater was observed (about 150 feet bgs) limits potential exposure to TCE and other VOCs by inhalation through potential vapor intrusion or dermal contact with groundwater;
- observed reduction (attenuation) in chlorinated VOC concentrations in groundwater samples collected in the southern portion of the site since 1991 (wells AOW-3, AOW-7, AOW-8 and AOW-9);
- remediation proposed for an on-Site source of chlorinated VOCs in the northwestern portion of the Site (source removal);
- the presence of other source(s) of TCE and other VOCs in groundwater in the Site vicinity (regional impacts); and
- issuance of a land use covenant to restrict the use of on-Site groundwater within the first water-bearing unit.

## 6.0 EVALUATION OF ALTERNATIVES

The following technologies were retained in the FS and further considered and evaluated in detail.

- No action;
- Excavation and off-site landfill disposal for surface and shallow COC-impacted soil and deep VOC-impacted soil;
- In situ stabilization of shallow metals-impacted soil, Stoddard solvent-impacted soil and PCB-impacted soil;
- SVE for shallow and deep VOC-impacted soil;
- SVE and bioventing for shallow and deep Stoddard solvent-impacted soil; and
- Demolition and disposal of PCB-impacted concrete.

These technologies were combined in the FS into potential alternatives for mitigating COC-impacted areas at the Site and are further evaluated in Section 6.2.

## 6.1 EVALUATION PROCESS

The Health and Safety Code section 25356.1(d) requires that remedy evaluations be based on requirements contained within the NCP 40 CFR 300.430. The NCP identifies evaluation criteria (also known as balancing or evaluation criteria) to be used in the development and scoping of remedial alternatives to provide a basis for comparison using additional, more detailed criteria, referred to as evaluation criteria. The criteria include those developed by the U.S. EPA in the NCP 40 CFR 300.430(a)(1)(iii) as modified by the State of California. All nine balancing criteria are used in this RAP (Threshold Criteria, Primary Balancing Criteria, and Modifying Criteria). These criteria are further described below.

### 6.1.1 Evaluation Criteria

NCP-based evaluation criteria are described below.

- Overall protection of human health and the environment [40 CFR 300.430(e)(9)(iii)(A)]: Evaluates if the alternative provides adequate protection and if the risks posed through each pathway are controlled, reduced or eliminated; and how the remedy achieves, maintains, or supports protection of human health and the environment.
- Compliance with State and Federal requirements [40 CFR 300.430(e)(9)(iii)(B)]: Evaluates how the alternative complies with applicable federal/state/local requirements and guidelines.
- Long-term Effectiveness [40 CFR 300.430(e)(9)(iii)(C)]: Refers to the ability of the alternative to maintain long-term reliable protection of human health and the environment over time, after remediation goals have been met, and identify the conditions that may remain at the Site after the remedy objectives have been met. Evaluation of the alternatives will also include factors such as treatment residuals.

- Reduction of Toxicity, Mobility, or Volume through Treatment [40 CFR 300.430(e)(9)(iii)(D)]: An evaluation of alternatives using this criterion will define the anticipated performance of the specific treatment technology. Refers to the ability of the remedy to reduce the toxicity, mobility and volume of COCs, the type and quantity of treatment residuals that will remain, and the degree to which the treatment will be irreversible.
- Cost [40 CFR 300.430(e)(9)(iii)(G)]: This assessment will evaluate the capital and operation and maintenance (O&M) costs for each alternative. The cost estimates will be assessed as capital cost, annual O&M cost, and present worth analysis.
- Short-term effectiveness [40 CFR 300.430(e)(9)(iii)(E)]: Evaluates the period of time necessary to implement the remedy, and identifies any adverse impact on the community, protection of workers, and potential environmental impacts that may arise during the implementation of the remedy, until the remediation goals are met.
- Implementability [40 CFR 300.430(e)(9)(iii)(F)]: Refers to the technical and administrative feasibility of implementing an alternative. Factors to be considered include construction and operation, monitoring duration considerations, required permits, and availability of necessary services and materials.
- Regulatory Agency Acceptance [40 CFR 300.430(e)(9)(iii)(H)]: Indicates whether the applicable regulatory agencies, after their review of the information, are in agreement with the preferred alternative.
- Community Acceptance [40 CFR 300.430(e)(9)(iii)(I)]: Indicates whether or not the community has a preference with regard to the remedy and if their concerns are being met.

## 6.2 DESCRIPTION AND EVALUATION OF REMEDIAL ALTERNATIVES

This section describes the remedial alternatives that were retained from the evaluation performed in the FS to address each COC. These alternatives are described below and evaluated against the Evaluation Criteria presented in Section 6.1.1 and summarized in Table 2.

### 6.2.1 Alternative 1

#### No Action

Alternative 1 consists of "No Action" and is included for evaluation pursuant to NCP 40 CFR 300.430(e)(6) and retained for comparison purposes. No below-grade demolition or soil remediation would be performed. "No Action" is not a viable alternative.

### 6.2.2 Alternative 2

#### Excavation and Disposal of COC-Impacted Soil and Demolition and Disposal of PCB Impacted Concrete

Alternative 2 consists of excavation and off-site disposal of shallow and deep COC-impacted soil (metals, PCBs, Stoddard solvent, and VOCs) to depths of approximately 8 feet bgs for metals, 12 feet bgs for PCBs, and 45 to 50 feet bgs for VOCs and Stoddard solvent, respectively. Excavation will require installation of shoring for sidewall stability and safety during soil removal. Vadose zone VOC remediation will promote a reduction in VOC concentrations in groundwater beneath the northern portion of the Site. This alternative also includes demolition and landfill disposal of concrete slab containing PCB concentrations greater than 3.5 mg/kg. In addition, PCB-impacted concrete (greater than 1.0 mg/kg and less than 3.5 mg/kg) would be crushed and deposited on site as restricted fill material (i.e., on site disposal) and covered with an interim cap consisting of a visual identifier layer and a minimum of 12-inches of clean crushed concrete (unrestricted fill material). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on site as unrestricted fill material. A land use covenant that incorporates an operation and maintenance (O&M) plan and soil management plan would also be included in this alternative.

### 6.2.3 Alternative 3

#### **Excavation and Disposal of Shallow COC-Impacted Soil, SVE for Shallow and Deep VOC-Impacted Soil, SVE and Bioventing for Shallow and Deep Stoddard Solvent-Impacted Soil, and Demolition and Disposal of PCB-Impacted Concrete**

Alternative 3 consists of excavation and off-site disposal of shallow COC-impacted soil (PCBs and metals) to depths of approximately 15 feet bgs. Shallow (up to 50 feet bgs) and deep (up to 90 feet bgs) VOC-impacted soil would be mitigated using SVE. Shallow (up to 50 feet bgs) Stoddard solvent-impacted soil would be mitigated using sequential treatment consisting initially of SVE, followed by longer term bioventing. Vadose zone VOC remediation will promote a reduction in VOC concentrations in groundwater beneath the northern portion of the Site. Deeper soils (at depths greater than 15 feet) impacted with PCBs above the remediation goal would be left in place and covered with a physical barrier at depth. The physical barrier would consist of 6-inches of cement concrete. This alternative also includes demolition and landfill disposal of PCB-impacted concrete slabs with PCB concentrations greater than 3.5 mg/kg. In addition, PCB-impacted concrete (greater than 1.0 mg/kg and less than 3.5 mg/kg) would be crushed and deposited on site as restricted fill material (i.e., on site disposal) and covered with an interim cap consisting of a visual identifier layer and a minimum of 12-inches of clean crushed concrete (unrestricted fill material). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on site as unrestricted fill material. A land use covenant that incorporates an O&M plan and soil management plan would also be included in this alternative.



#### 6.2.4 Alternative 4

##### **In Situ Stabilization of Shallow PCB/Metals-Impacted Soil and Deep Stoddard Solvent-Impacted Soil, SVE for Shallow and Deep VOC-Impacted Soil, and Demolition and Disposal of PCB-Impacted Concrete**

Alternative 4 consists of in situ stabilization (ISS) of shallow PCB- and metals-impacted soil and deep Stoddard solvent-impacted soil, using a cement-based additive to depths of approximately 15 feet bgs for PCB- and metals-impacted soil and approximately 50 feet for Stoddard solvent-impacted soil. Shallow (up to 50 feet bgs) and deep (up to 90 feet bgs) VOC-impacted soil would be mitigated using SVE. Vadose zone VOC remediation will promote a reduction in VOC concentrations in groundwater beneath the northern portion of the Site. This alternative also includes demolition and off-site disposal of concrete slabs containing PCB concentrations greater than 3.5 mg/kg. In addition, PCB-impacted concrete (greater than 1.0 mg/kg and less than 3.5 mg/kg) would be crushed and deposited on site as restricted fill material (i.e., on-site disposal) and covered with an interim cap consisting of a visual identifier layer and a minimum of 12 inches of clean, crushed concrete (unrestricted fill material). Non-PCB-impacted concrete (less than or equal to 1.0 mg/kg) would be crushed and reused on site as unrestricted fill material. A land use covenant that incorporates an O&M plan and soil management would also be included in this alternative.

#### 6.3 SUMMARY ANALYSIS OF ALTERNATIVES AGAINST THE NINE CRITERIA

The four alternatives are analyzed below using the nine evaluation criteria.

##### 6.3.1 Overall Protection of Human Health and the Environment

All of the alternatives, with the exception of the "No Action" alternative, meet this criterion by mitigating shallow COC-impacted soils and PCB-impacted concrete containing COC concentrations above the site-specific remediation goals, and eliminating source areas that could potentially impact groundwater.

##### 6.3.2 Compliance with Applicable Requirements

All of the alternatives, with the exception of the "No Action" alternative, meet this criterion. Because the "No Action" alternative would not be protective of human health and the environment and would not meet the remediation goals for the Site, Alternative 1 will not be discussed further in the criteria analysis below.

##### 6.3.3 Long-Term Effectiveness and Permanence

All of the alternatives would eliminate human exposure pathways between future receptors and soil, soil vapor, recycled concrete, and airborne dust. In addition, the SVE with bioventing as included in Alternative 3 and SVE as included in Alternative 4, are considered presumptive remedies, are minimally invasive, and can achieve site-specific remediation goals for shallow

and deeper VOC- and Stoddard solvent-impacted soil. Remediation of the VOC-impacted soil in the northern portion of the Site will promote long-term natural attenuation of VOCs in groundwater.

#### **6.3.4 Reduction of Toxicity, Mobility, and Volume through Treatment**

Alternatives 2 and 3 would reduce the toxicity, mobility, and volume of COC-impacted soil and PCB-impacted concrete. Alternative 4 would reduce the toxicity, mobility, and volume of PCB-impacted concrete and deeper VOC- and Stoddard solvent-impacted soil. Alternative 4 would also reduce the mobility of shallow COC-impacted soils, but volume and toxicity would not be significantly reduced by ISS treatment.

#### **6.3.5 Cost**

Costs for the excavation components in Alternatives 2 and 3 were based on an excavation rate of 500 cubic yards per day and confirmation sample rate of one sample per 200 cubic yards of excavated material. Shoring costs are included in all proposed excavation areas greater than 10 feet. Waste management costs associated with landfill disposal of metals, VOCs, and Stoddard solvent impacted soils were estimated assuming that 90 percent of the waste is classified as a non-hazardous waste and 10 percent of the waste is classified as a hazardous waste. Waste management costs associated with landfill disposal of PCB impacted soils were estimated assuming that 30 percent of the soil waste is classified as a non-TSCA waste and 70 percent of the soil waste is classified as a TSCA waste. Average thickness of the PCB-impacted concrete slabs was assumed to be 12 inches.

Costs for SVE for VOC-impacted soil in Alternatives 3 and 4 were based on rental of a minimum 1,000 cubic feet per minute (cfm) South Coast Air Quality Management District (SCAQMD)-permitted system operating for over a three year period. Bioventing costs for the Stoddard solvent impacted soil under Alternative 3 include operation of a SVE system for the first 3 months of a three-year period followed by operation of a pulsed air injection system over a the remainder of the three-year period.

Costs for soil stabilization in Alternative 4 are based on a stabilization rate of 300 cubic yards per day, maximum stabilization depth of 50 feet bgs, and a stockpile confirmation sample rate of one sample per 200 cubic yards. Cement-mixing-additives are assumed to be 10 percent of the stabilization material for cost estimating purposes. Cost assumes 20 percent of the mixed volume requires off-site disposal. Waste management costs associated with landfill disposal were estimated assuming that 90 percent of the waste would be classified as a non-hazardous waste and 10 percent of the waste would be classified as a hazardous waste. Estimated total capital cost for Alternatives 2, 3 and 4 are summarized in Table 2 and additional cost detail is provided in Appendix A.

### **6.3.6 Short-Term Effectiveness**

All of the alternatives will reduce risk to receptors and the environment if appropriate personal protective equipment (PPE) is worn by site workers; and if dust, noise and odor controls are implemented. Alternative 2 would have the greatest short-term impacts on the community and the workers due to potential air emissions produced during large-scale excavation activities. Alternatives 3 and 4 would have the least short-term impacts (with Alternative 3 being the least) on Site workers because deeper soil impacts would be mitigated using less invasive in-situ remedial technologies.

### **6.3.7 Implementability**

The technologies employed in Alternatives 2, 3 and 4 are reliable and have proven effective in previous field applications. Implementation is relatively straightforward using commercially available materials and equipment.

Additionally, the SVE and bioventing technologies associated with Alternatives 3 and 4 are considered presumptive remedies and have been demonstrated as effective on numerous other sites impacted by organic COCs similar to those present at the Site. Previous site-specific bench-scale treatability studies performed by Alcoa also demonstrated that the Stoddard solvent-impacted soils are amenable to bioventing as contained in Alternative 3. SCAQMD permits must be obtained for operation of the SVE systems for both VOC- and Stoddard solvent-impacted soils along with a monitoring and reporting program after system start-up.

Soil stabilization as described in Alternative 4 requires a bench-scale mix design test and mobilization of a crawler-mounted large diameter auger drilling rig. Shoring or other slope stability controls are required for all remedy components that include soil excavations greater than four feet deep.

## **7.0 PREFERRED REMEDIAL ALTERNATIVE**

Alternative 3, which consists of excavation and disposal of shallow COC-impacted soil, SVE for shallow and deep VOC-impacted soil, SVE and bioventing for shallow and deep Stoddard solvent-impacted soil, and demolition and disposal of PCB-impacted concrete, is the preferred remedial alternative described in Section 6.2.3. Alternative 3 is selected because it satisfies the balancing criteria discussed above, as required by Health and Safety Code section 25356.1(d) and the NCP, and will not require extensive soil excavation and off-site disposal. Alternative 3 is preferred to Alternative 4 because Alternative 3 will reduce the toxicity, mobility, and volume of COC-impacted soil to a greater extent than Alternative 4. Alternative 3 consists of soil excavation and disposal and SVE and bioventing in a balanced mitigation strategy that is the most cost-effective, is minimally invasive, and is protective of human health

and the environment. In addition, remediation of VOC-impacted soil will promote long-term natural attenuation of VOCs in groundwater. Implementation of the remediation components associated with Alternative 3 is described below.

## **7.1 PCB-IMPACTED CONCRETE REMEDIAL ACTION IMPLEMENTATION**

The preferred remedial approach for PCB-impacted concrete is demolition and disposal at an offsite landfill facility. This portion of the remedy will be implemented in conjunction with below-grade demolition of surface slabs and pavements. Based on the results of the screening HHRA and attenuation modeling for protection of groundwater, a site-specific PCB remediation goal of 3.5 mg/kg has been proposed to be applied as the crushed concrete reuse criterion (on-site disposal). Concrete that exceeds the remediation goal cannot be reused on site and will be removed and disposed off site during below-grade demolition to offsite landfill facilities designated to receive TSCA-regulated PCB-containing wastes. Concrete slabs with PCB concentrations greater than 1 mg/kg and less than 3.5 mg/kg will be crushed on site and deposited on site with restrictions as excavation backfill. This material will be placed in a localized area (former Building 104) at depths greater than 5 feet bgs, demarcated with a visual identifier layer, then covered with crushed concrete containing less than 1 mg/kg of PCBs (interim cap), as required by U.S. EPA. Concrete slabs with PCB concentrations less than or equal to 1 mg/kg will be crushed on site and reused without restriction at the Site as fill during grading activities. Figure 4 shows concrete sampling concentrations and locations, and defines areas where PCB concentrations in concrete exceed 1 mg/kg, 3.5 mg/kg, and 50 mg/kg.

### **7.1.1 Site Preparation**

PCB-impacted concrete will be demarcated at the Site by painting a "cut line" on the slab to identify those areas previously delineated by slab coring and laboratory analytical testing. The cut lines will encircle areas previously identified to contain PCB concentrations greater than 1.0 mg/kg, greater than 3.5 mg/kg, and greater than 50 mg/kg (Figure 4).

### **7.1.2 Slab Removal and Stockpiling**

Slabs will be saw-cut or broken along demarcation lines to facilitate removal using construction equipment. PCB-impacted slabs will be removed, sized for handling, and either temporarily stockpiled on site in separate piles or bins based on concentrations prior to disposal, or direct-loaded into hauling trucks for landfill disposal. All PCB-impacted concrete wastes slated for landfill disposal will be shipped off site within 30 days of generation pursuant to 40 CFR 761.65(c)(1).

Slab areas where PCB concentrations exceed 50 mg/kg will be direct-loaded into bins or hauling trucks for off-site landfill disposal as a TSCA PCB hazardous waste. Concrete

containing PCBs with concentrations greater than 3.5 mg/kg will be direct-loaded for off-Site landfill disposal as a TSCA, bulk PCB remediation waste. Concrete with PCB concentrations greater than 1 mg/kg but less than 3.5 mg/kg (restricted use fill) will either be removed and stockpiled on site pursuant to 40 CFR 761.65(c)9 prior to crushing and reuse as restricted fill; or removed and placed directly into an excavation as restricted fill.

In areas with PCB-impacted concrete, the concrete slabs will be observed during removal for multiple layers of concrete and visible staining. Concrete slabs or below-grade structures exhibiting visual signs of staining will be segregated for sampling and analysis for PCBs. During periods of inactivity, PCB-impacted concrete stockpiles will be covered to control dispersal of material via wind or runoff pursuant to 40 CFR 761.65(c)9. Contractor stockpiling activities will be performed pursuant to Section 02114 of the Below Grade Demolition and Soil Excavation Technical Specifications (Technical Specifications) (Appendix B).

Perimeter air monitoring will be conducted during slab removal and stockpiling as described in Section 7.2.4.

### 7.1.3 Soil Sampling Beneath PCB-Impacted Concrete

In areas where soil verification and characterization data does not already exist beneath newly identified PCB-impacted concrete slabs with PCB concentrations above 3.5 mg/kg, additional in-situ soil characterization samples will be collected after slab removal is complete to determine the concentration at which PCBs may be present. The frequency by which these soil samples will be collected will be selected in the field using the sampling frequency provided below.

Concrete Slab Areas (in feet)	Grid Spacing	Additional Samples	Estimated Number of Samples
Horizontal dimensions up to approximately 10 by 10 feet	None	<ul style="list-style-type: none"> <li>1 soil sample at the center of the exposed soil area, or directly beneath the location where the concrete core sample exhibited the highest PCB concentration</li> </ul>	1
Horizontal dimensions up to approximately 20 by 20 feet	Grid divided into 2 equal parts	<ul style="list-style-type: none"> <li>2 samples; one from the center of each grid part</li> <li>1 sample; directly beneath the location where the concrete core sample exhibited the highest PCB concentration</li> </ul>	3
Horizontal dimensions up to approximately 50 by 50 feet	Grid divided into 4 equal parts	<ul style="list-style-type: none"> <li>4 samples; one from the center of each grid part</li> <li>1 sample; directly beneath the location where the concrete core sample exhibited the highest PCB concentration</li> </ul>	5

The actual number of confirmation soil samples collected from beneath the PCB-impacted slabs will be selected in the field based on the size of the area and the location of adjacent footings and below-grade structures. These confirmation samples will be collected using the procedures described in Appendix B of the Quality Assurance Project Plan (QAPP) (Geomatrix, 2007), and the SAP (AMEC, 2010a).

Additional PCB-impacted soil found at concentrations above the site-specific remediation goals for soil (at depth between 0 and 15 feet bgs) will be removed and verification sampling will be implemented as described in Section 7.2.7.

#### **7.1.4 Concrete Profiling, Transportation, and Disposal**

Concrete characterization data or additional concrete sampling data collected prior to or during below-grade demolition will be used to create a waste disposal profile at a facility permitted to receive PCB-impacted wastes. The appropriate TSCA notification of PCB activity will be filed with the U.S. EPA, as required.

Concrete containing total PCBs greater than 1 mg/kg are considered bulk PCB remediation waste. Concrete with total PCBs greater than 1 mg/kg but less than 3.5 mg/kg (concrete remediation goal) will be disposed on site as restricted fill in selected deeper soil excavation areas (greater than 5 feet bgs) then covered with an interim cap pursuant to Section 2110 of the Technical Specifications (Appendix B). Concrete containing total PCBs less than 1 mg/kg will be used as unrestricted fill on site during backfilling and grading activities.

Porous surfaces impacted with PCBs greater than 1 mg/kg, including asphalt and certain piping made of or coated with porous material shall be disposed of in accordance with 40 CFR 761.61.(a)(5)(i). Concrete containing PCBs at concentrations that exceed risk-based remediation goals (greater than 3.5 mg/kg) will also be disposed of in accordance with 40 CFR 761.61.(a)(5)(i). Any non-porous materials such as metal piping impacted with PCBs greater than 1 mg/kg, that are removed during demolition of slabs and below-grade structures, are also considered PCB remediation waste, and shall be disposed of in accordance with 40 CFR 761.61(a)(5)(i)(B)(2)(ii) and 761.61(a)(5)(i)(B)(2)(iii).

After impacted concrete and other bulk PCB remediation wastes are profiled, they will then be removed and loaded into trucks for transportation to an off-site landfill for disposal pursuant to Section 02120 of the Technical Specifications (Appendix B), and the Hazardous Materials Transportation Plan (AMEC, 2010b; revised 2012). All PCB-impacted concrete wastes slated for landfill disposal will be shipped off site within 30 days of generation.

Each truck load will be covered with either a tarpaulin or plastic sheeting prior to departing the jobsite. Wastes shipped off site in roll-off bins or containers will have closed tops. All truck

exteriors will be inspected and cleaned of any loose soil or concrete debris that may be present on the truck exterior associated with loading activities. The contractor will take proper measures to prevent Site soil or debris from being tracked onto adjacent City right-of-ways during off-site shipment. Cleanup wastes, including non-liquid cleaning materials and PPE impacted with PCBs greater than 1 mg/kg, shall be disposed of as PCB remediation waste in accordance with 40 CFR 761.61(a)(5)(v). All loads will be properly manifested and placarded.

#### **7.1.5 Decontamination of Equipment and Tools**

Construction equipment and tools used during the removal and handling of PCB-impacted concrete and soil will be decontaminated prior to exiting the Site. Sampling equipment used during collection of confirmation or verification samples will be decontaminated prior to first use and between sampling locations (U.S. EPA, 2008).

Working surfaces that have contacted PCBs will be decontaminated with hexane using the double wash/rinse methods as defined in 40 CFR 761 Subpart S. Decontamination waste and residues will be collect, properly containerized and labeled, then disposed off site in accordance with 40 CFR 761.60. The decontamination waste will be profiled for disposal pursuant to 40 CFR 761.79(g).

### **7.2 SURFACE/SHALLOW COC-IMPACTED SOIL REMEDIAL ACTION IMPLEMENTATION**

The preferred remedial technology for surface and shallow COC-impacted soil is excavation and off-site landfill disposal. These remedial excavation areas are shown on Figure 57. This remedy will be implemented after below-grade demolition of surface slabs and pavements, utilities and pipelines, pits, sumps, and other deeper structures is complete.

#### **7.2.1 Groundwater Monitoring-Wells and Monitoring**

As required by DTSC, an additional groundwater monitoring well will be installed in the northwest corner of the Site to support the MNA groundwater approach. The newly installed groundwater monitoring well and the remaining three groundwater monitoring wells AOW-6, AOW-8, and AOW 9 (located in the Phase IIIb and Phase IV areas), will remain in place and protected during demolition. These wells will be used to obtain current groundwater flow direction information, and groundwater samples will be periodically monitored for VOCs and natural attenuation parameters. The proposed MNA monitoring program for the VOC-impacted groundwater in the northern portion of the Site is provided below.

- After the installation of the new groundwater monitoring well, the groundwater monitoring well will be surveyed and developed. Well development will be conducted using surge and bail methods. Field groundwater quality parameters (pH, temperature, specific electrical conductance [SEC], and turbidity) will be measured and recorded periodically to assess the progress of development.

Development will continue until stabilization of field groundwater quality parameters, and when the water is relatively clear and free of suspended sediment. A minimum of three saturated well volumes (saturated screen plus filter pack void space) will be removed from the well during development.

- The new well along with three existing on-site groundwater monitoring wells (AOW-6, AOW-8, and AOW-9) will be monitored on a quarterly basis for the first year. The frequency of monitoring events may be modified pending evaluation of data collected over several sampling events.
- Prior to purging and sampling, water levels will be measured in each groundwater monitoring well to evaluate the hydraulic gradient across the site.
- The groundwater monitoring well network will be purged using a submersible pump and sampled using a bailer. Field parameters including pH, specific electrical conductance [SEC], temperature, dissolved oxygen (DO), oxidation reduction potential (ORP), and turbidity will be monitored during purging and sampling activities.
- Groundwater samples will be collected and analyzed for the following constituents to monitor and assess the viability of MNA:
  - VOCs using U. S. EPA Method 8260B.
  - calcium, magnesium, manganese, sodium, and potassium, using U.S. EPA Method 6010B
  - Total Kjeldahl Nitrogen (as N) using Standard Method 4500-NH3 C.
  - ammonia (as N) using Standard Method 4500-NH3 D.
  - chloride using Standard Method 4500-Cl-C.
  - total alkalinity (as CaCO<sub>3</sub>) using Standard Method 2320B, total sulfide using Standard Method 4500S-D.
  - total phosphorus using Standard Method 4500 E.
  - dissolved iron using U.S. EPA Method 200.7.
  - iron (II) using Colorimetric Hach Method 8146.
  - methane, ethane, and ethene, using RSK-175M.
  - nitrate, nitrite, organo-phosphate, and sulfate, using U.S. EPA Method E300, and
  - total organic carbon using Standard Method Standard Method 5310B.
- Field quality assurance/quality control (QA/QC) samples including equipment rinsate blank, temperature blank, and trip blank samples used to assess field precision and accuracy will be collected at a frequency as described in the QAPP (Geomatrix, 2007).
- Laboratory QA/QC samples including laboratory duplicate samples, laboratory control samples, matrix spike/matrix spike duplicates used to assess laboratory precision and accuracy will be collected and prepared at a frequency described in the QAPP (Geomatrix, 2007).



After the initial testing is completed, a sampling schedule and ~~suite of analysis~~ will be provided to DTSC for future sampling events.

In addition, if the MNA approach does not reduce the Site-derived TCE concentrations in groundwater then an alternative groundwater remedy may be considered in the future.

When required, the wells will be destroyed in accordance with applicable guidelines listed in the California Department of Water Resources Bulletin 74 81 and 74-90 upon completion of remediation of the Stoddard solvent-impacted soil and upon receipt of authorization from the DTSC.

### **7.2.2 Site Preparation**

Site preparation includes obtaining necessary permits, implementation of storm water and dust controls, and installation of excavation shoring prior to soil removal. These tasks are further described below.

### **7.2.3 Storm Water Controls**

Storm Water Best Management Practices will be implemented and maintained around the excavation perimeter and soil stockpiling areas pursuant to Section 01502 of the Technical Specifications (Appendix B) and the ~~contractor's~~ Storm Water Pollution Prevention Plan (SWPPP) (American Integrated Services, Inc., revised 2011~~9~~).

### **7.2.4 Dust Controls and Perimeter Air Monitoring**

Dust control measures will be implemented during soil excavation and handling (and concrete crushing activities) pursuant to Section 01501 of the Technical Specifications (Appendix B). The primary dust control measure will be the application of water sprays or mists. Site perimeter air monitoring will be conducted as described in the Revised Perimeter Air Monitoring Plan (AMEC, ~~2011b~~2012b). The plan includes, among other things, a season-specific wind rose and a figure showing wind flow patterns in the vicinity of the Site in relation to neighboring communities. Air monitoring instruments will be located on the Site based on this information.

### **7.2.5 Shoring**

Site preparation may require installation of shoring around the perimeter of each proposed excavation area greater than 10 feet deep pursuant to Section 02260 of the Technical Specifications (Appendix B). A Shoring Plan will be prepared by the contractor and submitted to the City for review and approval prior to actual shoring installation.

### **7.2.6 Excavation and Stockpiling**

Soil will be excavated using a track-mounted excavator capable of removing soil to depths of greater than 15 feet bgs. Soil will be excavated to the lateral and vertical extent of known COC-impacts based on previous site characterization sampling data. Excavated soil will be staged adjacent to the excavation and then transferred to a lined and bermed temporary stockpile located on site. Contractor soil stockpiling activities will be performed pursuant to Section 02114 of the Technical Specifications (Appendix B).

### **7.2.7 Confirmation and Verification Sampling and Waste Profiling**

Confirmation soil sampling within open excavation areas will be conducted using the procedures described in Appendix B of the QAPP (Geomatrix, 2007). Verification samples will be collected from soil removal areas with PCB impacts. Verification samples will be collected in the same manner as the confirmation samples, and will adhere to the guidelines outlined in the SAP (AMEC, 2010a).

Soil samples will also be collected from the temporary stockpile for waste profiling purposes to meet the acceptance criteria of the receiving facility, prior to off-site landfill disposal. Soil analytical testing will be performed to meet the waste profile requirements of the receiving facility.

### **7.2.8 Off-Site Disposal**

COC-impacted soil will be loaded into trucks and shipped off site for landfill disposal pursuant to Section 02120 of the Technical Specifications (Appendix B). Each truck will be covered with either a tarpaulin or plastic sheeting prior to departing the jobsite, and all truck exteriors will be inspected and cleaned of any loose soil that may be present on the truck exterior after loading. The contractor will take proper measures to prevent Site soil from being tracked onto adjacent City right-of-ways during off-site shipment. All loads will be properly manifested and placarded.

### **7.2.9 Backfilling and Grading**

Excavation areas will be backfilled with crushed recycled aggregates obtained from on-site crushing of concrete demolition debris (as unrestricted fill with PCB concentrations less than or equal to 1 mg/kg). Restricted fill with PCB concentrations greater than 1 mg/kg and less than or equal to 3.5 mg/kg will be used as backfill at a designated location on site as described in Section 7.1.2. Aggregates will be crushed to the gradations provided in Section 02050 of the Technical Specifications (Appendix B), and will be backfilled and compacted pursuant to Section 02351 of the Technical Specifications (Appendix B).

### 7.2.10 Schedule for Implementation

Excavation and off-site disposal of the COC-impacted soil will be performed by the contractor during the implementation of below-grade demolition and soil excavation work. Below-grade demolition work is anticipated to start after agency approval of the RAP and completion of the public participation activities. It is anticipated that the below-grade demolition and soil remediation work can be completed in approximately four to six months, excluding any potential weather-related delays.

## 7.3 SHALLOW AND DEEP VOC-IMPACTED SOIL REMEDIAL ACTION IMPLEMENTATION

The preferred remedial technology for shallow and deep VOC-impacted soil (containing TCE, PCE, and benzene) in the Phase I area is SVE. This remedy will be implemented upon completion of below-grade demolition associated with slab, foundation, footing, and other structure removal in the Phase I area at the Site. A network of SVE wells will be installed with well screen intervals both above and below the fine-grained soil unit present from approximately 50 to 70 feet bgs in the northern portion of the Site. SVE wells will be installed at the Site within the area of known impacts and at other locations where VOCs were detected in soil and soil vapor at concentrations exceeding the site-specific remediation goals. Some of these SVE wells will be placed adjacent to the northwestern property boundary to facilitate coverage of the Site-derived soil vapor impacts observed directly adjacent to the Site on Fruitland Avenue as shown on Figures 86 and 97. Soil cuttings generated during well installation work will be contained as investigation-derived waste for profiling and off-site disposal. Specific details regarding the SVE system and associated remediation equipment are provided below.

### 7.3.1 Site Preparation

After completion of below-grade demolition and limited soil excavation work related to footings and foundations removal in the Phase I area, the area will be re-graded and compacted. The area will be topographically lower than previous Site conditions prior to foundation and soil removal. A four- to six-inch thick layer of crushed recycled aggregates, obtained from the on-site crushing of clean concrete demolition debris, will be spread across the Phase I area to provide a suitable working surface during implementation of SVE.

A three-phase, 240-volt, 200-ampere temporary electrical power service panel will be installed on a temporary power pole in the northwest corner of the Site to obtain electricity from existing power lines located along Fruitland Avenue. The temporary power pole and electrical service panel will be required to operate the SVE system, and will be located inside the existing concrete perimeter wall near the intersection of Boyle and Fruitland Avenues.

### 7.3.2 Well Installation

SVE wells will be installed in the Phase I area at two specific depth intervals as presented below.

SVE Well Depth	Well Screen Interval (feet bgs)	Estimated Well Radius of Influence	Well Lateral Spacing	Number of Wells
Surface to 50 feet bgs	40 to 50	60 to 75 feet	<del>100 to 120 feet</del>	15
Surface to 90 feet bgs	80 to 90	85 to 100 feet	<del>200 to 240 feet</del>	4

The approximate number of SVE wells proposed in the RAP was based on professional judgment and previous knowledge of radius of influence (ROI) values for similar types of lithologies observed at different sites. The shallow screen intervals are located at a depth that corresponds to the coarse-grained soils above the upper surface of the fine-grained unit observed at a depth of approximately 50 feet. This 10-foot screened interval was selected to target the upper vadose zone (between the depths of 5 to 50 feet) where impacted soil and soil vapor were observed with elevated VOC concentrations. The 10-foot screen will facilitate a larger ROI in both the horizontal and vertical directions. The deeper screen intervals are located near the approximate depths of deeper soil samples that contained elevated VOC concentrations. The top of the deeper screen interval (80 feet bgs) is approximately at the bottom of the fine-grained unit. Figures ~~86~~ and ~~97~~ provide the proposed SVE well locations, and Figure~~10~~-8 contains a generalized construction diagram for the proposed SVE wells.

Prior to start-up, soil vapor samples will be collected from the SVE wells to establish baseline conditions. An evaluation of the effective area of influence will be performed at the Site after the proposed SVE well network is installed. Additional SVE wells may be added based on effective area of influence both above and below the fine-grained unit. Wellhead completions will consist of an above-ground flow-controlling ball valve and sample port for periodic soil vapor sampling and area of influence monitoring. Each SVE well will be constructed using Schedule 40 polyvinyl chloride (PVC) pipe with a 0.020-inch slot screen size, a sand filter pack surrounding the well screen, a bentonite seal, and a concrete surface seal (Figure ~~108~~).

### 7.3.3 Temporary Piping

SVE wells will be connected to the treatment equipment by temporary Schedule 40 PVC piping and/or flexible suction hose placed directly on the crushed recycled aggregate surface. Vapor will be conveyed to a 6-inch diameter common header line (adequate to support the combined soil vapor pressures and flow rates from each SVE well), and then to the portable SVE equipment for treatment. A process flow diagram for the proposed system is shown on

Figure 9~~11~~. Each vapor extraction well head will be equipped with a vacuum gauge port and a ¼-inch brass tap that may be removed for insertion of a hotwire anemometer for flow measurement. A detail of the well head piping is shown in Figure 10.

#### 7.3.4 Treatment Equipment

The treatment equipment will consist of a trailer- or skid-mounted system with a SCAQMD permit. The equipment will include a moisture knockout drum, a blower/compressor capable of applying a vacuum of 100 inches of water and a minimum flow rate of 500 to 1,000 cfm, a minimum of two 1,000-pound vapor-phase granular activated carbon (vGAC) vessels, and associated equipment connections. A piping and instrumentation diagram for the anticipated skid-mounted treatment system is shown on Figure 44~~123~~. The size and arrangement of the vGAC vessels will depend on the specific requirements of the SCAQMD permit. The moisture knockout drum will be situated upstream of the compressor/blower with the vGAC vessels configured in series and installed downstream of the compressor/blower. The system will be connected to the SVE well piping grid.

The compressor/blower will convey extracted soil vapor from the SVE well field to the common header line, through the moisture knockout drum, and then to the vGAC vessels. Moisture that collects in the knockout drum will be manually pumped or transferred to and stored in 55 gallon capacity Department of Transportation-approved drums. The drums will be characterized and transported off site for disposal on an as needed basis. Treated soil vapors conveyed through the vGAC vessels will be discharged to the atmosphere in compliance with SCAQMD permit conditions.

#### 7.3.5 Startup Testing

Startup testing will be performed to verify the functionality of the equipment and collect information to document the area of influence of the SVE system. Functionality testing will include a diagnostic check of each component including, but not limited to, the knockout drum controls, compressor/blower operation, emergency shutdown controls, high temperature and level alarms, and leaks in piping.

Once the system has passed the functionality test, the system will be started and data will be collected for the purpose of documenting the area of influence. Testing will focus on two SVE wells, while the remaining SVE wells will be used as monitoring points during the area of influence test. The two SVE wells will be tested for approximately 6 hours using a step-vacuum test. The vacuum applied to each extraction well will be varied every 2 hours based on the approximate schedule summarized in Table 3.

Following startup and area of influence testing, a report documenting the results will be submitted to the DTSC. The report will include as-built diagrams, summary of the installation and startup activities, data collected during area of influence testing, and vacuum versus flow relations for the tested wells. In addition, the report will document the plan for O&M and monitoring of the SVE system including a procedure for rebound testing, steps for closure, and copies of air permits.

#### **7.3.5.1 Soil Vapor Sampling**

Soil vapor samples will be collected from the SVE wells at the frequency shown in Table 3. These samples will be collected in Tedlar bags using a vacuum sample box and analyzed in the field for VOCs using a photoionization detector (PID). Prior to collecting soil vapor samples from the SVE wells, a volume equal to approximately two times the casing volume will be purged. The soil vapor samples collected during testing will be analyzed for total hydrocarbons using EPA Method TO-3 and VOCs using EPA Modified Method TO-15.

#### **7.3.5.2 Vacuum and Flow Rate Monitoring**

During startup testing, vacuum at selected SVE wells, and the treatment system will be monitored with a hand-held digital manometer at the time intervals shown in Table 3. SVE wells will be sealed at the wellheads during testing by closing the isolation gate valve shown in Figure 4012. A quick-disconnect port installed in the piping will be used to measure the wellhead response to the applied vacuum at each SVE well. The observed vacuums will be used in establishing the area of influence.

The flow rate from each SVE well will be recorded using a digital hot wire anemometer connected to the SVE system at the time intervals shown in Table 3. The flow rate measurements will be used to assess flow rate capacities for the SVE wells.

#### **7.3.6 Operations, Maintenance, and Monitoring**

Operation of the SVE system will begin after completing start-up testing. The system will be monitored initially by demolition observation field personnel already present on site at a minimum of twice per week during the first month of operation. Operating personnel will collect measurements that will be used to evaluate the system's overall performance and effectiveness in remediating the VOC-impacted soils. Field measurements will consist of recording system operating parameters including: hours of operation, operating temperatures, extraction flow rates, and inlet and outlet vapor concentrations for the vGAC vessels using the same methods identified in the startup testing. SVE system monitoring will be performed in compliance with the SCAQMD permit requirements or minimally on a weekly basis.

Maintenance performed during routine system inspections and/or monitoring will comply with SVE vendor and/or equipment specifications. As part of the monitoring of the system, influent and effluent concentrations will be measured using a portable organic vapor meter such as a PID, which detects and quantifies organic vapors. Results of operation monitoring will be recorded on emission monitoring logs. Influent and effluent vapor samples will be collected in a 1 liter Tedlar bag using a sample collection box and submitted to an analytical laboratory on a monthly basis for the analyses prescribed in the SCAQMD permit. Additional monitoring will be performed in accordance with the SCAQMD permit to operate. A startup testing report will be submitted to DTSC within 60 to 90 days after completion of startup. Remediation monitoring reports will be provided to DTSC on a quarterly basis during the first year of operation, then semi-annually thereafter until remediation is deemed complete.

### **7.3.7 Schedule for Implementation and Completion**

SVE of shallow and deep VOC-impacted soil will commence after below-grade demolition and soil excavation are completed in the Phase I area. The milestone phasing and completion of work as described in Section 01110 of the Technical Specifications (Appendix B) require the contractor to complete below-grade demolition work in the Phase I area within 40 calendar days after mobilizing to the Site and installation of required temporary facilities and controls. SVE system installation and SVE operations will begin approximately four weeks after contractor completion of below grade demolition work in the Phase I area.

SVE operation will continue until commercial/industrial facility construction commences or until effluent vapor monitoring from SVE wells indicate vapor concentrations have reached asymptotic conditions. If Site construction is delayed and subsurface concentrations still warrant SVE operations beyond 12 months, a site-specific SCAQMD permit will be obtained.

If asymptotic conditions have not been reached prior to future commercial/industrial facility construction, SVE operation will be suspended until construction is complete, if necessary. After completion of construction, SVE operation will be restarted, and if needed, new SVE wells will be installed and operated until the following pre-closure requirements have been met.

1. The SVE system has targeted the zones of impacted soil on the basis of the initial design and quarterly monitoring.
2. The SVE system has been optimized based on routine monitoring and regular optimization reviews.
3. The optimized SVE system has met an asymptotic mass removal rate for the VOCs based on vapor samples collected for laboratory analysis and vapor flow measurements conducted at individual wells and/or the influent to the treatment system.

The system will then be shut down to undergo vapor rebound testing, followed by additional operations as necessary. The rebound testing process will be documented in the Startup documentation report discussed in Section 7.3.5. Post-remediation soil matrix confirmation sampling will be performed in previously defined VOC hot spot areas upon completion of rebound testing and termination of SVE operation.

While future Site development may limit physical access into certain areas, efforts will be made to obtain soil matrix samples from approximate locations consistent with previous VOC characterization sampling events in the VOC impacted areas. Approximately six soil borings will be advanced to groundwater and eight soil samples will be collected from both above and below the fine-grained unit located at a depth of approximately 50 feet bgs. These soil samples will be analyzed for VOCs using EPA Method 8260B/5035. Soil sampling results may be used to document the remaining concentrations of VOCs in soil for a deed-land use covenant for the Site.

#### **7.4 SHALLOW AND DEEP STODDARD SOLVENT-IMPACTED SOIL REMEDIAL ACTION IMPLEMENTATION**

The preferred remedial technology for the shallow and deep Stoddard solvent-impacted soil in the Phase IIIb and Phase IV areas is SVE and bioventing. This remedy will be implemented during the below-grade demolition and soil remediation activities at the Site and prior to any subsequent redevelopment construction of other commercial/industrial facilities. Although bioventing is related to the process of SVE, and both technologies involve movement of air through the subsurface, the differences in objectives result in different design and operational requirements of the remedial systems (Leeson & Hinchee, 1996). The major distinction between these technologies is that SVE optimizes removal of low-molecular weight compounds by volatilization achieved through high rates of vapor extraction (under vacuum). SVE will be performed initially to remove the approximately 15 percent volatile fraction of COCs present in the Stoddard solvent areas. When vapor monitoring data indicate asymptotic conditions have been reached, the SVE system will be shut down and converted to a bioventing remedial process to continue the in situ remediation process of the less volatile hydrocarbon compounds remaining in the subsurface.

Bioventing optimizes biodegradation of aerobically degradable compounds using much lower air flow rates than those required for SVE systems, thus minimizing both volatilization and capital costs. The system conversion to bioventing would consist of reversing the air flow direction by injecting atmospheric air into the subsurface through the SVE piping grid and vent wells at a greatly reduced flow rate. Air injection would be achieved in a pulsed or intermittent manner, for the equivalent of approximately one day per week. Air injection rates will be modified as needed (increase or decreased) based on oxygen utilization rates.



A network of venting wells will be installed to depths of approximately 50 feet bgs in the areas where Stoddard solvent COCs exceed site-specific remediation goals. The vent wells will be used for SVE, bioventing and monitoring. Specific details regarding the SVE and bioventing system and associated remediation equipment/components are provided below.

#### 7.4.1 Site Preparation

Existing surface slabs and below-grade footings will be left intact in the Phase IIIB and IV areas during implementation of the in situ SVE and bioventing remedy to reduce odors and dust from the Stoddard solvent-impacted areas. The existing building slab may be used as a working surface for equipment and staging materials associated with the adjacent below grade demolition work.

A three-phase, 240-volt, 100-ampere temporary electrical power service will be installed in the vicinity of the south end of former Building 112A to power the SVE and bioventing system equipment.

#### 7.4.2 Vent Well Installation

Venting wells will be installed in the Phase III and IV area at a single depth interval as presented below.

Vent Well Depth	Well Screen Interval (feet bgs)	Well Lateral Spacing	Number of Wells
Surface to 50 feet bgs	15 to 50	60 to 120 feet	15

Figure 42-13 provides the locations of the proposed vent wells. Wellhead completions will consist of a flush-mount well box to contain a flow-controlling gate valve, vacuum gauge port, and a ¼-inch brass tap that may be removed for insertion of a hotwire anemometer for flow measurement. A detail of the well head piping is shown on Figure 10. Each vent well will be constructed with a 2-inch diameter Schedule 40 PVC pipe with a 0.020-inch slot screen, sand filter pack, bentonite seal and concrete surface seal. Wells installed for initial SVE operation will also be used during subsequent bioventing activities. Prior to start-up, soil vapor samples will be collected from the vent wells to establish baseline conditions. Figure 8-10 contains a schematic construction diagram for the proposed vent wells.

#### 7.4.3 Well Piping

Vent wells will be connected to the treatment equipment with Schedule 40 PVC piping placed along the surface of the slab, ground surface, or in below grade trenches constructed by saw-cutting and removing surface concrete slabs along designated piping corridors. Pipe

construction and installation configuration will be determined in the field to accommodate below-grade demolition work. Piping trenches may be backfilled to slab grade with a one-sack cement slurry. A process flow diagram for the proposed bioventing system is shown in Figure 142.

#### 7.4.4 Treatment Equipment

Initial SVE operations will be performed using a trailer-mounted system in conformance with a SCAQMD Various Locations permit. The system will be similar in configuration to the SVE unit proposed to remediate shallow and deep VOC-impacted soil as described in Section 7.3. The equipment will consist of a compressor/blower, two 1000-lb vGAC vessels, moisture knockout drum, and associated equipment connections. It is anticipated that the SVE equipment will be similar to that used for the Phase I area, and the piping and instrumentation diagram for the anticipated skid-mounted treatment system is shown as Figure 1244. Extracted condensate captured in the moisture knockout drum during SVE operations will be characterized and transported off site for disposal on an as-needed basis.

Bioventing equipment will consist of a separate skid-mounted system comprised of a minimum 5.0 horse power electric blower capable of injecting air up to 150 cfm at 10 pounds per square inch. The blower will be equipped with a dilution air valve and temperature probe. Atmospheric air will be injected at low-flow rates of approximately 1 to 3 cfm per vent well in a pulsed or intermittent manner, through a common header line that connects to each well to provide oxygen to native soil microbes. No volatile exhaust gases or fugitive emissions are anticipated to be generated that would require treatment because the compressor/blower will be injecting air at a very low rate and no vent wells will be open to the atmosphere.

#### 7.4.5 Startup Testing

Startup testing will be performed to verify the functionality of the equipment, collect information to document the area of influence of the SVE system, and perform a respirometry test to confirm the size of the bioventing system needed. Functionality testing will include a diagnostic check of each component including, but not limited to, the knockout drum controls, compressor/blower operation, emergency shutdown controls, high temperature and level alarms, and leaks in piping.

Once the system has passed the functionality test, the SVE system will be started and data will be collected for the purpose of documenting the area of influence. Testing will focus on two vent wells, while the remaining vent wells will be used for monitoring during the area of influence test. The two vent wells will be tested for approximately 6 hours using a step-vacuum test as described in Section 7.3.5 at the frequency summarized in Table 3. At the

conclusion of the SVE testing, the system will be shut down and an in situ respiration (ISR) test will be performed using the same vent wells.

Following startup, area of influence testing, and ISR testing a report documenting the results will be submitted to the DTSC. The report will include as-built diagrams, summary of the installation and startup activities, data collected during area of influence testing, data collected during ISR testing, and vacuum versus flow relations for the tested well. In addition, the report will document the plan for O&M and monitoring of the SVE and bioventing systems including a procedure for rebound testing, steps for closure, and copies of air permits.

#### **7.4.5.1 Soil Vapor Sampling**

Soil vapor samples will be collected from the vent wells at the frequency shown in Table 3. These samples will be collected in Tedlar bags using a vacuum sample box and analyzed in the field for VOCs using a PID. Samples will also be analyzed for oxygen content, carbon dioxide and explosive gases with a landfill gas monitor (or equivalent meter). Prior to collecting soil vapor samples from the vent wells, a volume equal to approximately two times the casing volume will be purged. The soil vapor samples collected during testing will be analyzed for total hydrocarbons using EPA Method TO-3 and VOCs using EPA Modified Method TO-15.

The vapor extraction will be continued until oxygen concentrations measured in the vent wells is between 19 percent and 21 percent. The system will then be shut down and ISR data will be collected from the test well and the monitoring wells. ISR test vapor samples will be collected from the vent wells at the frequency shown in Table 3, and these samples will be analyzed, as before, for VOCs, oxygen, carbon dioxide, and methane. Differential pressure, static pressure, and temperature measurements will be recorded at each vent well. The vapor sample collection schedule proposed in Table 3 will be modified as necessary with the goal of continuing sampling until the in situ oxygen content drops by at least 7 percent. These results will be used to calculate the oxygen utilization rate.

#### **7.4.5.2 Vacuum and Flow Rate Monitoring**

During startup testing, vacuum at selected vent wells, and the treatment system will be monitored with a hand-held digital manometer at the time intervals shown in Table 3. Vent wells will be sealed at the wellheads during testing by closing the isolation gate valve shown on Figure 4012. A quick-disconnect port installed in the piping will be used to measure the wellhead response to the applied vacuum at each SVE well. The observed vacuums will be used in establishing the area of influence.

The flow rate from each vent well will be recorded using a digital hot wire anemometer connected to the SVE system at the time intervals shown in Table 3. The flow rate measurements will be used to assess flow rate capacities for the vent wells.

#### 7.4.6 Operations, Maintenance, and Monitoring

The SVE system will operate initially and be monitored bi-weekly until effluent vapor monitoring from vent wells indicate vapor concentrations have reached asymptotic conditions based on vapor samples collected for laboratory analysis and vapor flow measurements conducted at individual wells and/or the influent to the treatment system. After asymptotic conditions are reached, the system will be converted to bioventing without pulse-mode operation or performance of rebound testing. Pulse mode operations or rebound testing will not be performed because continued remediation of the Stoddard solvent impacts will be achieved through the bioventing process. Bioventing will degrade the less volatile hydrocarbon fraction still present along with any residual volatile constituents that may still be present and are degrading. Following conversion of the SVE and bioventing equipment, start-up will consist of a diagnostic check of the treatment equipment and adjusting the air flow at each vent well. Once operational, the bioventing system will require very little maintenance and monitoring.

The ISR testing performed during startup testing would be periodically repeated to monitor oxygen utilization rates and carbon dioxide production rates to evaluate progress of remediation. Methane, carbon dioxide, oxygen, differential pressure, static pressure, and temperature will be measured using a landfill gas monitor (or equivalent) with a sampling frequency as determined during the startup testing. The measurements will be recorded in a daily field log. The frequency of the ISR testing will be at a minimum monthly for the first six months of operation and quarterly thereafter. Monitoring frequency will be adjusted based on monitoring results. ISR rates can be expected to vary over time and a general decrease in rates over the longer term of hydrocarbon biodegradation. A startup testing report will be submitted to DTSC within 60 to 90 days after completion of startup. Remediation monitoring reports will be provided to DTSC on a quarterly basis during the first year of operation, then semi-annually thereafter until remediation is deemed complete.

The system will be operated until soil gas monitoring results through existing vent wells indicate biodegradation is no longer occurring at a significant rate. Soil confirmation sampling will then be performed to substantiate that site-specific remediation goals have been achieved for the Stoddard solvent related COCs, and, if necessary to support a deed-land use covenant for the Site.

When the use of the Phase IIIB and IV areas are no longer needed for site construction laydown and staging, or when monitoring data suggest the remediation of the Stoddard solvent vapor phase is sufficient for slab removal, the surface slab and below grade structures will also be demolished and removed in a manner similar to other parts of the Site.

#### **7.4.7 Schedule of Implementation and Completion**

SVE and bioventing of shallow and deep Stoddard solvent-impacted soil will begin within 30 days after Site mobilization for below-grade demolition. SVE and bioventing operations will continue until data from soil gas monitoring through existing vent wells indicate that biodegradation is no longer occurring at a significant rate and that soil testing confirms that the site-specific remediation goals have been met.

#### **7.5 SOIL MANAGEMENT DURING AND AFTER BELOW-GRADE DEMOLITION**

The demolition contractor will be responsible for handling and disposal of impacted soil removed during demolition. A field Geologist or Engineer will be present while below-grade demolition and soil removal is being performed at the Site. There is a potential for impacted soil to be encountered during removal of pavements, floor slabs, footings, foundations, utilities, and other below-grade structures (e.g., sumps, drains, etc.). As these features are removed during demolition, the demolition contractor will follow the procedures described in this section. The procedures associated with the below grade-demolition described in this section are included in the project technical specifications provided in Appendix B.

During removal of the slab and other below-grade structures, the demolition contractor will monitor for hazardous vapors and observe the condition of the underlying surface of the concrete slab and the condition of the soil underlying the slab. If areas of impacted soil that were not included in the areas shown on Figures 3 and 75 and addressed in Section 7.2 are observed (based on visual staining and/or noticeable odors or by testing proposed in Section 7.1.3), the demolition contractor will take the following general steps.

1. Notification - notify both the Site manager and the field Geologist or Engineer present on site, and begin air monitoring with a PID.
2. Monitoring - conduct initial air monitoring for health and safety and SCAQMD permitting compliance with the PID. If PID readings are above Rule 1166 permit criteria, continue using Rule 1166 requirements and the requirements of Section 02114 of the Technical Specifications (Appendix B). If the PID readings are above health and safety air monitoring thresholds, workers will upgrade to the appropriate PPE specified in the demolition contractor's Health and Safety Plan (HASP).
3. Segregation - segregate impacted soil from the slab or structure(s) already being removed. As visually impacted structures are removed, the suspect soil directly adjacent to and beneath the structures will also be excavated, segregated, and/or

stockpiled on plastic (with a minimum thickness of 6 mil) and covered with plastic or placed in covered roll-off bins or in end dumps, as needed based on volume.

4. Soil removal - conduct exploratory soil removal to assess the extent of impacted soil based on visual indicators and continue air monitoring:
  - if the area of impacted soil appears to be a "small area" (up to 100 cubic yards of soil), continue to remove soil and stockpile as needed, then continue with demolition work.
  - if the area of impacted soil appears to be greater than 100 cubic yards ("large area"), work in this area will be coordinated and phased with other excavations of known COC-impacted soils. The area will then be visually demarcated by the contractor.
  - COC-impacted areas will then be excavated to the extent necessary to meet site-specific remediation goals discussed in Section 5.3.
5. Confirmation sampling - confirmation soil sampling will be conducted using the procedures described in the QAPP (Geomatrix, 2007). The analytical suite for soil samples tested may include VOCs, PCBs, or metals. If additional samples are collected, the soil analytical results will be compared to the site-specific remediation goals discussed in Section 5.3 to assess the need for additional removal or backfilling of the excavation. If soil testing is deemed not necessary based on existing data, the excavation will be backfilled.
6. Excavation backfill - after confirmation sampling is complete, excavations will be backfilled and compacted by the demolition contractor as described in the Below Grade Demolition Plan (Geomatrix, 2006a, AMEC 2011). Concrete debris with concentrations of COCs less than the remediation goals will be crushed to the gradations provided in Section 02050 of the Technical Specifications, and backfilled and compacted pursuant to Section 02351 of the Technical Specifications (Appendix B).

During below-grade demolition, and as required by DTSC, shallow soil testing will be conducted below the buried rail lines during removal. Once the rail lines are removed, shallow soil samples will be collected and tested for metals. In addition, the underlying soil will be observed for petroleum hydrocarbon impacts. If soil samples collected beneath the rail lines are impacted with metals and/or petroleum hydrocarbons at concentrations above the site-specific remediation goals, the steps described above for soil removal, confirmation sampling, and excavation backfill will be conducted.

During these activities, health and safety procedures will be implemented by the demolition contractor as described in the contractor's site-specific HASP. In addition, dust suppression and vapor and/or odor control will be implemented by the demolition contractor as needed using the requirements of Section 01501 of the Technical Specifications (Appendix B).

Any stockpiled soil will be sampled for laboratory analysis. Soil and waste disposal profiling will be completed by the contractor and soil will be transported using appropriate shipping manifests or bills-of-lading. The demolition contractor will notify the Site manager prior to shipping any impacted soil and waste off site. Storm water management associated with the stockpiled materials will be the responsibility of the demolition contractor pursuant to Section 01502 of the Technical Specifications (Appendix B) and the contractor's SWPPP.

After completion of the below-grade demolition, soil excavation work, and installation of the SVE and SVE/bioventing systems, a site-specific soil management plan will be prepared and incorporated into the land use covenant described in Section 7.6. The soil management plan will describe the procedures for handling impacted soil or crushed concrete (containing PCBs greater than or equal to 1 mg/kg) that will remain on Site at concentrations below the site-specific remediation goals.

## **7.6 LAND USE COVENANT**

The Site is zoned for industrial use, and the City of Vernon zoning regulations prohibit development of new residential properties within the City. The future Site use will remain industrial or commercial. A land use deed-covenant is proposed to be issued by Pechiney, with concurrence from the City of Vernon, to restrict future site use (i.e., prohibit residential development) and use of groundwater from the first water bearing unit within the site perimeter. The land use covenant will be prepared after completion of the below demolition, soil excavation work and installation of the SVE and SVE/bioventing systems.

## **7.7 O&M AGREEMENT AND PLAN**

The proposed remedy described above in Sections 7.3 and 7.4 (SVE and SVE/bioventing) will be covered under an O&M agreement between Pechiney and DTSC. This agreement will provide a list of the responsibilities for O&M work and it will include items such as future Site access requirements, implementation and monitoring of the SVE and SVE/bioventing systems, and protection and maintenance of the groundwater wells and SVE wells. As part of the agreement, an O&M plan will be prepared and it will be incorporated into the land use covenant for the Site.

## **8.0 PUBLIC PARTICIPATION**

As required by the NCP 40 CFR 300.430(c)(1) and DTSC, Pechiney will ensure that the public is informed and has the opportunity to participate in the overall remedial action for the Site. A comprehensive community involvement plan will be submitted following the submittal of this RAP. Public participation will be implemented as part of demolition and remediation activities. The community involvement program and activities are described below.

## **8.1 COMMUNITY INVOLVEMENT PROGRAM**

The objective of the community involvement program is to inform the community of the progress of demolition and remediation activities and to effectively respond to health, environment and safety concerns and questions. The community involvement program will be consistent with DTSC requirement and CERCLA as implemented by the NCP 40 CFR 300.430(c)(1). The purpose of these activities as stated by the NCP 40 CFR 300.430(c)(2)(ii)(A) is to "ensure the public appropriate opportunities for involvement in a wide variety of site related decisions, including site analysis and characterization, alternatives analysis, and selection of remedy; and to determine, based on community interviews, appropriate activities to ensure such public involvement."

Objectives of the community involvement program include:

- soliciting input from the community on concerns about the remedial activities;
- establishing effective channels of communication between the community, Pechiney, and the DTSC;
- informing the community about progress of the remedial activities; and
- providing adequate opportunities for the community to participate and comment on the proposed remedial activities.

## **8.2 COMMUNITY INVOLVEMENT ACTIVITIES**

To date, Pechiney has conducted community outreach activities to its immediate neighbors including face-to-face visits from the project and field engineers. As part of the below-grade demolition phase of the project, DTSC has begun the community interviews and may distribute information to the immediate neighbors of the Site including proposed activities and schedule of work.

Prior to the start of the remedial activities, DTSC will expand its outreach and distribute an information fact sheet to businesses and residents surrounding the Site and to other interested stakeholders. This fact sheet will include information about the Site, remedial activities, and project contacts. Additionally, a local information repository will be established to make documents and other information available for the public and a Site mailing list will be developed.

This RAP will be made available to the public for a comment period of at least 30 days. DTSC will respond to any comments received during the public comment period and will provide a timely opportunity for the public to access documents.



Depending on the level of community response and level of interest, DTSC may hold a community meeting to discuss the components of the RAP, the Site's history, and proposed remedial work. The meeting may also provide the opportunity for the public to submit comments on the RAP. DTSC will work with the community to develop a meeting format that best suits the needs of the community.

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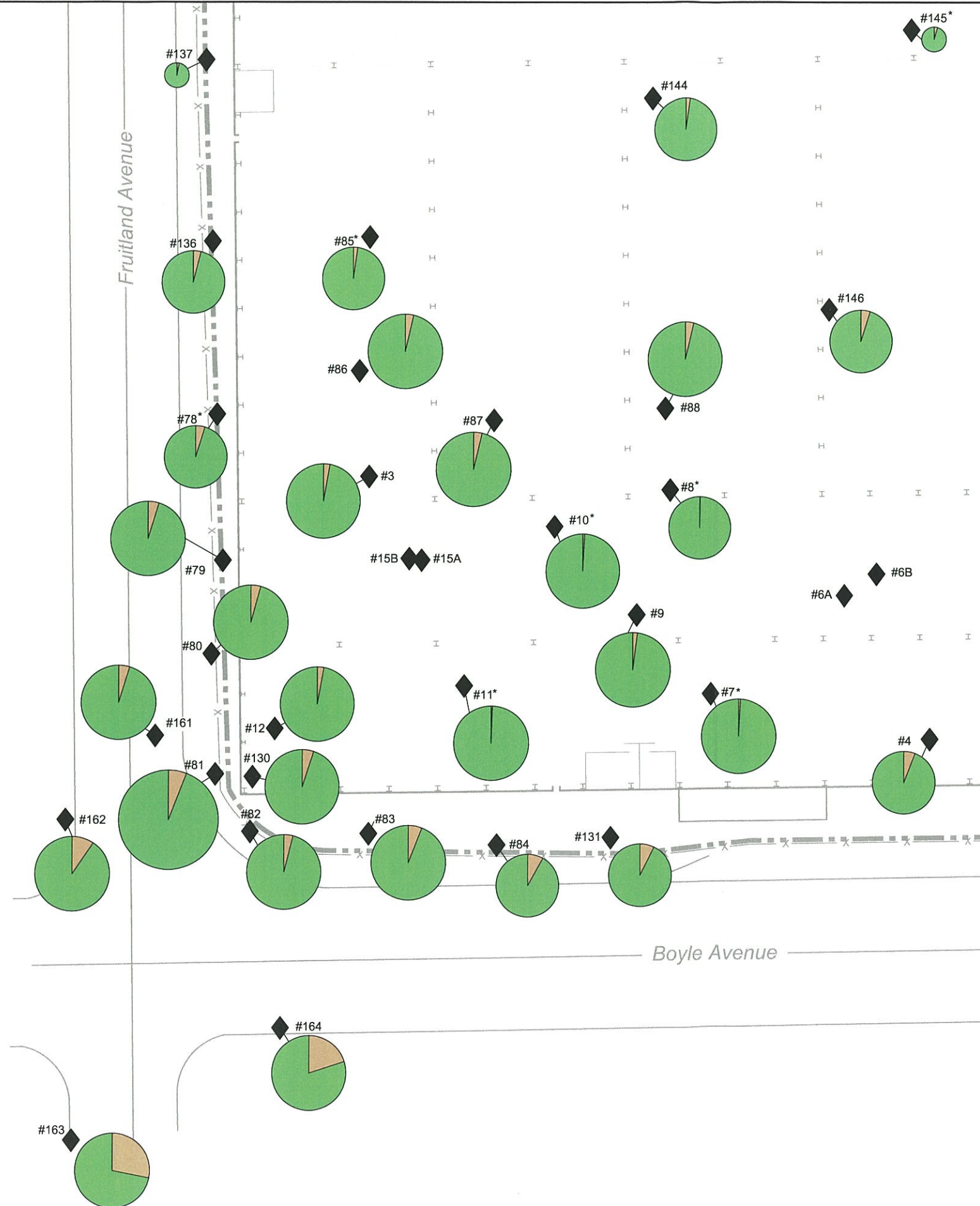
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Plot Date: 04/23/12 - 5:31pm, Plotted by: pat.herring  
Drawing Path: Y:\10627.003\06acadi\Reports - 2012\RAP - 2012\, Drawing Name: \_lb Distribution of PCE to TCE.dwg



## Explanation

#164 ◆ Geomatrix soil vapor sampling point

--- Property boundary

Total molar concentration of tetrachloroethene (PCE) and trichloroethene (TCE) in soil vapor at 5 feet below ground surface

○ <0.1

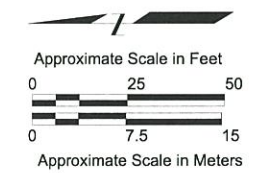
○ ≥0.1 and <1.0

○ ≥1.0 and <10

○ ≥10

Ratio of molar concentration of PCE to TCE

#78\* ◆ PCE or TCE concentration was below the detection limit; ratio calculated using 0.5 of the report limit



Basemap modified from Pechiney Cast Plate, Inc. Site Plan dated January 8, 2002, Geraghty & Miller, Inc. "Groundwater Elevation and Volatile Organic Compound Concentrations December 8, 1994" Figure dated February 2, 1995, Aluminum Company of America "Works General-Map" figure dated October 10, 1984, and Los Angeles County Assessor's Office Parcel Map 6310 / Sheet 8 dated November 5, 1958.

DISTRIBUTION OF PCE TO TCE  
IN SOIL VAPOR AT 5 FEET  
Former Pechiney Cast Plate, Inc., Facility  
3200 Fruitland Avenue  
Vernon, California

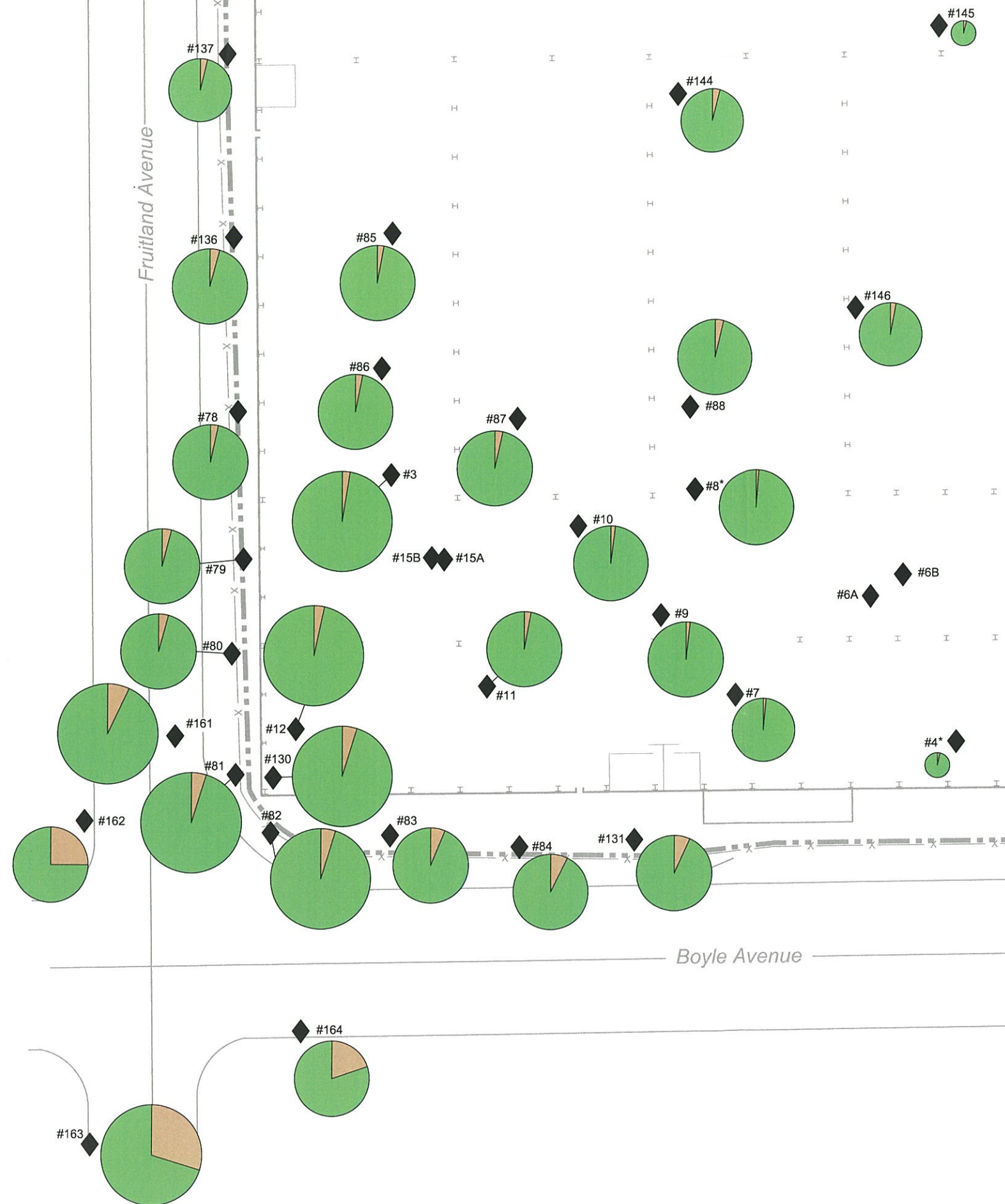
By: pah Date: 04/23/12 Project No. 10627.003

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Figure 5



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## Explanation

#164 ♦ Geomatrix soil vapor sampling point

--- Property boundary

Total molar concentration of tetrachloroethene (PCE) and trichloroethene (TCE) in soil vapor at 15 feet below ground surface

○ <0.1

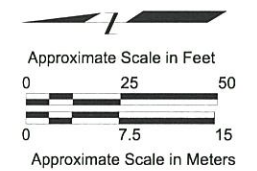
○ ≥0.1 and <1.0

○ ≥1.0 and <10

○ ≥10

Ratio of molar concentration of PCE to TCE

#4\* ♦ PCE or TCE concentration was below the detection limit; ratio calculated using 0.5 of the report limit



Basemap modified from Pechiney Cast Plate, Inc. Site Plan dated January 8, 2002, Geraghty & Miller, Inc. "Groundwater Elevation and Volatile Organic Compound Concentrations December 8, 1994" Figure dated February 2, 1995, Aluminum Company of America "Works General-Map" figure dated October 10, 1984, and Los Angeles County Assessor's Office Parcel Map 6310 / Sheet 8 dated November 5, 1958.

DISTRIBUTION OF PCE TO TCE  
IN SOIL VAPOR AT 15 FEET  
Former Pechiney Cast Plate, Inc., Facility  
3200 Fruitland Avenue  
Vernon, California

By: pah Date: 04/23/12 Project No. 10627.003



Figure 6